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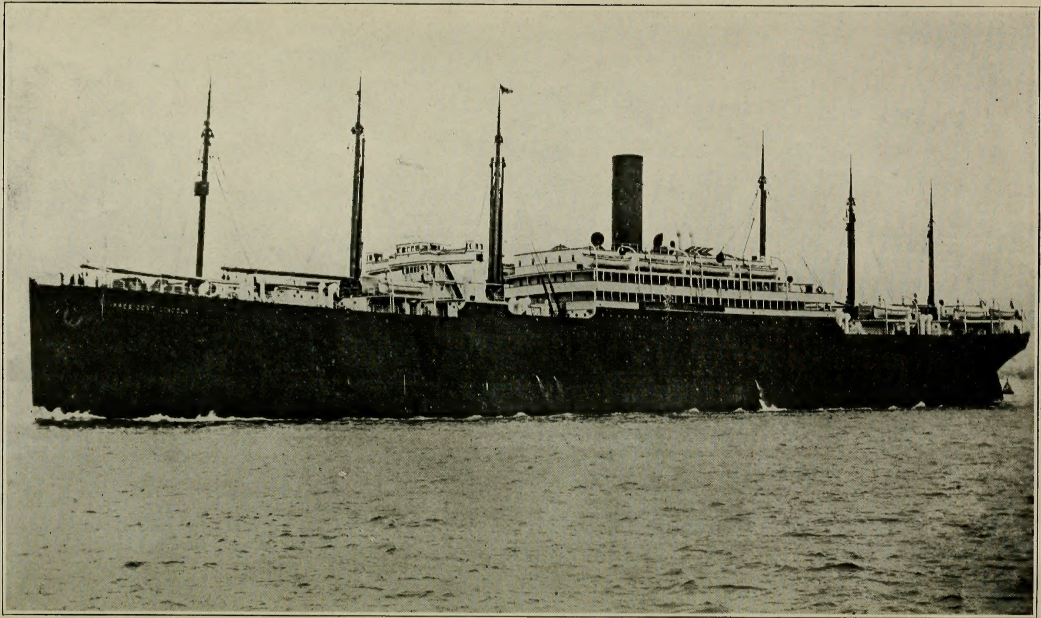

U. S. S. "President Lincoln," Formerly of the Hamburg-American Line

Ex-German Ship Converted into United States Troopship. Carried 5,000 Troops, 7,000 Tons of Cargo and 700 Officers and Men. As She Appeared Before the War. Two Torpedoes Struck Her Abreast the Second Mast and a Third Torpedo Struck Between the Fourth and Fifth Masts.

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NARRATIVE OF THE "PRESIDENT LINCOLN"

By the Commanding Officer, Commander P. W. Foote, U. S. N.

When the U. S. S. *President Lincoln* was sunk by the German submarine *U-90,* on May 31, 1918, there was an exhibition of cool courage and efficient performance of duty in the face of impending death that will fill a bright page in the records of the deeds of the men of our navy. The crew of the ship was composed largely of young men who, a few months before, had been engaged in the various pursuits of civil life, but the work and experiences during the preceding winter months, when the ship had voyaged back and forth across the ocean, had been a good school and under the guiding hand of the few officers and men of sea experience, this crew met the test in a way that was truly remarkable and the memory of their clock-like performance of duty will always fill with pride the heart of the commanding officer. Colonel Clopton, the commanding officer of the troops on board, afterwards said that the scenes attending the sinking of the ship "seemed like a moving picture" and it was difficult to believe that the ship was really sinking.

We had made five trips to France, having transported about twenty-five thousand soldiers to help "lick the Hun" and we had almost come to believe that the ship bore a charmed life and that

she would not be sunk—such is the way that the human mind adjusts itself to conditions imposed upon it.

We had sailed with many ships in convoy groups, running at night without lights with ships a few hundred yards on each side of us, and we had almost come to regard the danger of collision with other ships—and this was an ever-present danger at night—as more perilous than the danger from the enemy's submarine.

On our previous voyage, however, we had sighted what we believed to have been a submarine, but as he was directly ahead of us in the edge of a fog, he was unable to attack and disappeared before we could fire at him.

We left Brest, France, about dark on May 29 in company with three other naval transports, the *Susquehanna,* the *Antigone,* and the *Rijndam,* and we were escorted by American and French destroyers until dark on May 30, when these boats left us to join a large convoy of ships bound for France. We hoped to pass safely through the remaining part of the war zone under the cover of darkness of that night.

On the afternoon of the thirtieth we had held Memorial Day services in honor of devoted Americans, dead on land and sea, and, in our safety, our hearts went out to those boys in the trenches and on the seas who still faced sudden danger and who might be, at that very hour, giving their lives for Liberty.

As the destroyers, one by one, disappeared in the darkness, we took up the duties of an added vigil, for we had on board many wounded heroes going back to "God's country" to regain their strength, and the long night watches must be kept with diligence until we had passed safely through the remainder of the war zone. We trusted to the darkness as an added measure of safety, for, on the morrow, we would be clear of the U-boats' hunting-ground.

The morning of May 31 broke fine and clear, the sun shone brightly and as we were then in about longitude 17 degrees west and about 500 miles from the coast of France, we felt that the worst dangers of another voyage through the war zone were over and that New York and home were only a little way before us. Satisfied that all was well, a few minutes before nine o'clock I

went into the cabin under the bridge, entered my stateroom for a wash, and then walked into the cabin again for breakfast. At that instant there came a terrific crash and a loud explosion and I noticed that most of the furniture in the stateroom and cabin was wrecked and tossed about.

Starting for the companion way, I was met at the door by the messenger from the bridge, Seaman Leslie Lowenstein, who reported, "Sir, the officer of the deck says we are hit."

Once on the bridge, I found the fact too true; we had been hit, not once, but thrice. The port side of our devoted ship was riddled. The *U-90,* a speedy German submarine commanded by Captain Remy, had haunted our wake since midnight for a chance to strike. With the dawn that chance had come, and, with hell-born aim, he sent us to our doom.

As I reached the bridge, I found that the officer of the deck, Lieutenant Martin, U. S. N. R. F., had sounded the alarm and the call to "battle stations" and had stopped the engines. The gun crews had been on watch at the guns and were ready to fire, but there was nothing to shoot at. The submarine had only exposed his periscope long enough to get his aim, fire, and dive. The track of the torpedoes indicated that he was near the ship on our left, the *Ryndam,* about 800 yards distant, when he fired. Afterwards we found this to have been the case, and the *Ryndam* had tried to ram the submarine, but he was so close to the ship that she could not turn onto him before he dived out of sight.

The four ships were in line abreast and the sub had picked the *President Lincoln* as she was much larger than the others.

All the officers and men and the army passengers went to their stations and the reports of readiness came to the bridge, quite in the usual way as had been done at drill.

The engineer officer reported the engines and boilers "secured" and ready for orders. There was no undue hurrying or confusion. The carpenter's repair parties went below decks and inspected the conditions of the bulkheads and the holds adjacent to the ones flooded with water. This was a dangerous duty, as if the bulkheads should suddenly give away the ship might sink so quickly that these men could not have escaped to the upper decks, but there was no flinching of these men and I was kept informed of the condition of the holds and interior spaces.

From my position on the bridge, I could see the boat crews standing by their boats all along both sides of the ship and other groups of men were standing by the life rafts. At the guns on the forecastle and on the main deck aft, the gun crews were searching for something to fire at.

The hatch just abaft the bridge was open, as men had been engaged in handling coal in that hold when the torpedoes struck the ship and some of these men only barely escaped the inrushing water. The executive officer, Lieutenant Commander Lind, U. S. N., and I watched water rise in this hatch and the engineer officer reported water entering the engine room. The men on watch in the engine and fire rooms under the direction of Lieutenent Baker, U. S. N. R. F., performed their duties with characteristic coolness and efficiency and escaped to the upper decks without the loss of a man.

It soon appeared that the ship was doomed and orders were given to lower the boats and rafts into the water and a little later all hands were ordered to "abandon ship."

The method which we had adopted required every one except the sick to go into the water and swim to the rafts and then to be picked up by the boats. This was done in order that the boats might be lowered practically empty, with only two men in each boat to handle the falls, so as to prevent spilling men from the boats as they were lowered, which, I had observed, generally occurred on occasions when ships have met with disaster. This plan worked splendidly and it largely accounts for the comparatively small loss of life.

The discipline was perfect. With everyone at his station, I ordered the boats lowered, but as the boats were lowering the ship straightened up on nearly an even keel and I thought that it might not be necessary to leave her. I ordered "stop lowering," but the escaping steam prevented the men from hearing the order. They could see me, however, and on a motion of my hand the boats stopped and were held on their falls. A little later, when it was evident that the ship was doomed, I gave the signal with my hands to lower the boats, and they were promptly lowered, but without undue haste.

As the men stood at their stations, I thought of the famous scenes of the sinking of the British ship *Camperdown,* which sank with all hands at quarters and the band playing *God Save the Queen.*

Standing orders required the gun crews to remain at their guns until special orders were given for them to "abandon ship" as there might be a chance to fire on the enemy should he come up to take a look at the damage he had done and to gloat over his prey. He did not appear, but the guns were ordered to open fire in the direction in which he might be as it might prevent another immediate attack. When the guns began firing it was a thrilling and heartening thing to hear the cheers of the men in the water and on the rafts and boats around the ship. They felt that something was being done to "strike back" at the Hun who had, from his hidden position under the water, wounded us to death.

The ship settled gradually, nearly on an even keel, listed a little to starboard and down a little by the stern. It was hard to realize that she was actually sinking before our eyes and we could do nothing to save her.

The chief master-at-arms, Sam Rogers, a sailor man of the old school, devoted to the navy, the ship, her officers and crew, reported to me that the decks were clear of the people. The main deck then being under water, the gun crews were ordered to jump overboard and those of us left went down the ladders into the water and swam to the rafts about a hundred feet from the ship. A few minutes later the ocean seemed to engulf the ship. I noticed the bridge houses and structures crash down under the weight of the waves and then there was nothing except a little wreckage on the surface of the water. Our good ship had gone to her grave, two thousand fathoms under the sea.

The flag was flying on the aftermast when she sank and her guns had been firing up to the last minute, which were fitting honors for the ship which we loved so well, for we had all come to love the "Old *President Lincoln*" and the hardships of the winter had bound men and ship into a team which loved to undertake difficult things.

It had been about thirty minutes from the time she was struck till the ship sank. The job then was to collect all rafts and boats

together and wait—hoping that the destroyers might come to our rescue—in answer to the "S O S" sent by the other ships which were with us. I knew the destroyers were about two hundred and fifty miles away with the other convoy, but I also knew that it was possible that the safety of that convoy might demand the presence of the destroyers, and in that case we should have to wait till they could come from Brest, five hundred miles away. This would mean more than a day and in that time the weather and sea might become so rough as to wash all those on the rafts into the sea. I felt confident of assistance from Admiral Wilson, however, if he had received the radio message, and this confidence proved to be fully warranted, for when Admiral Wilson received the radio reporting the sinking of the ship, he promptly detached one destroyer, the *Warrington,* and an hour later sent another, the *Smith,* from the cargo ships convoy to our rescue. In speaking of this afterwards, Admiral Wilson said he fully realized the military necessity for protecting the supplies in those ships which were vital to fill the needs of the army but the thoughts of the crew of the *President Lincoln* adrift on the ocean five hundred miles from land appealed to him above everything else and he promptly sent the destroyers to our assistance. The American navy, thank God, has not yet reached the point where a bale of hay or a side of beef is worth more than a sailor's life.

But the work of collecting the boats and rafts was soon interrupted and about half an hour after the ship sank we saw what appeared to be a small sailboat approaching, but we knew this could not be and that it was the enemy's submarine returning to look us over and probably take some prisoners. It was really hard to realize that we were at last to look the enemy in the face, but it was a bitter thing to know that we could no longer contend with him and were practically at his mercy.

The sub very soon came among the boats and rafts searching for officers, particularly the comanding officer. He took one man, G. A. Anderson, aboard, but later returned him to his boat. The U-boat commander asked Anderson many questions about the ship, but treated him kindly.

Most of the officers removed their coats and caps so as not to show the marks of their rank. The sub commander asked fre-

quently for the commanding officer, but the men always replied that he had gone down with the ship. At one time the sub was within thirty yards of the boat I was in and the men seemed to enjoy very much telling him that "the captain went down with the ship." By that time he had identified one officer, Lieutenant E. V. M. Isaacs, U. S. N., and had taken him on board. When Isaacs was called from his boat, he said to his men, "Good-bye, men, it is all in the game." This cheerful spirit of Isaacs was characteristic of the entire ship's company, but the later experiences of Isaacs, were to put this spirit to a severe test when he exerted himself to the utmost to escape from the German prisons and finally succeeded after the most thrilling and daring exploits.

The sub remained near us about two hours and went away and returned for a short while, hoping probably that some of the ships which had been with us might return and that he would get a shot at them. This delayed our work and the boats and rafts became widely separated. Although this contingency had been foreseen and many rafts had been lashed together, yet they had drifted apart in groups and it was a hard job to tow them with the boats, which were heavily loaded with men, and this, with the choppy sea, made the rowing hard and we had great difficulty in assembling the boats and rafts.

The danger of a boat or raft being separated from the group was the cause of great anxiety, as in this case it might drift so far during the night that it could not be found. Everyone did his best, however, and when darkness fell we had all the rafts with people in them, securely tied together and the string of twelve boats was tied to the rafts, so we could then all drift together. We could do nothing more than wait and hope that the destroyers would find us before our scant supply of bread and water became exhausted. Lighted lanterns were suspended from oars hoisted in the boats and "coston flares" were burned every few minutes, but as we were so near the surface of the water, these lights could not be seen more than two or three miles.

There were about four hundred and fifty men in the boats and two hundred and fifty on the rafts. It was intended to change places at daylight so that those on the rafts could come into the

boats, as they would be much exhausted after the night on the rafts.

Men and officers were put on watch in each boat and the others told to go to sleep. There was no moon and it became very dark. It was hard to fully realize, even then, that there floating around me on a few boats and rafts, literally on the bosom of the ocean, was that fine body of officers and men who had served so loyally under my command, and that we were all that was left of what, a few hours before, had been a brave ship doing her utmost in our country's service. But I thanked God that I still had so many of them with me, as an approximate muster showed about twenty-five or thirty missing out of a total of about seven hundred on board.

In the blackness and silence of the night with the "slap" of the waves against the boats as we drifted before the wind, it was a time to try our courage and cheerfulness and the light from our little "flare-up" torches seemed so futile in its effort to penetrate the blanket of darkness which covered the ocean.

But the motto of the *President Lincoln* as printed daily on our little paper, called the *Railsplitter* in affectionate memory of that great American patriot and President whose name was borne by our ship, was "Loyalty, Efficiency, and Cheerfulness," and it will always be my pleasure to testify that every one measured up to this motto in a way that was truly inspiring, and not a word of complaint, sorrow, or regret was uttered by those men as we lay there in the sea and waited for the hours to pass. The discipline and willingness to obey orders was perfect and no officer ever commanded a more devoted body of men.

About eleven o'clock some one in my boat thought that he saw a light, but after looking eagerly for it without success, we were settling down in the bottom of the boat again, when from another direction, but almost over us, there suddenly appeared in that wall of darkness a "blinking" white light. There was no mistaking the light this time and I thought of the Star of Bethlehem. The light flashed a few times, then darkness again—the enemy's submarine may be lying in wait for the rescuing ship. Then a megaphone calls from the darkness, "Who is there?" and I reply, "The crew of the *President Lincoln,*" and "Who are you?" "The

Survivors of the "President Lincoln" on Board the U. S. Destroyer "Warrington"

U. S. S. *Warrington*" is the reply. And then a cheer that rose from those men, literally from out of the ocean, broke the stillness of the night and in its volume and strength this cheer not only expressed overwhelming joy at the arrival of this ship for our rescue, but to me it expressed a greater joy and feeling of thankfulness that those officers and men had met the crucial test and that they had fully measured up to the spirit and motto of our ship as well as to the tradition of our navy.

Although we had been stabbed to death by an unseen enemy, yet we had at all times prepared for this and were always ready to battle with the enemy under just these circumstances hoping that good fortune might give us a chance for striking an effective blow in return even though the odds were all against us.

The captain of the *Warrington,* Lieutenant Commander George W. Kenyon, U. S. N., then asked, "How many boats have you?" To my great joy I replied, "All of them."

In speaking of this afterwards Kenyon said that he had dreaded to ask this question as he feared that the boats and rafts would be widely separated and adrift on the ocean, making it difficult, if not impossible, to find all of them. Such would have been the case had we not provided against this by lashing the rafts together in groups and even then these groups would have been widely scattered but for the hard work and determination of the men, under the encouragement of the officers, who labored hard at the oars all that day, pulling the boats which were heavily loaded with men, a great many of whom were weakened by seasickness. But these men stuck to the job and I shall never forget their loyalty and willingness under these trying circumstances.

The *Warrington* reported that the destroyer *Smith* was also coming to our rescue and she arrived about an hour afterwards under the command of Lieutenant Commander J. H. Klein, U. S. navy.

The transfer from the boats and rafts to the destroyers was promptly accomplished, the darkness causing some difficulty, but this also served as a protection against another attack from the submarine had he been waiting for this purpose.

We had about four hundred and fifty men on the *Warrington* and two hundred and fifty on the *Smith.* The *Warrington* was

quite crowded, but the hot food and cordial welcome we found on those ships almost caused us to forget our troubles. I particularly remember two soldiers who were totally paralyzed and who had been tenderly cared for by our hospital corpsmen. They were placed in the officers' beds and it was a pleasure to see their smiles of cheerfulness and relief after the dangers they had passed through.

A muster showed that we had lost three officers and twenty-three men. Two of the officers, Lieutenant Commander Whiteside (M. C.), the senior doctor, and Lieutenant Commander Mowat (P. C.), the senior paymaster, were last seen on the after deck of the ship and for some unexplained reason failed to escape from the ship. The other officer, Ensign Johnson (P. C.), the junior paymaster, was on a raft near the ship with another man but the raft was drawn under the water when the ship sank and although the man escaped, Ensign Johnson lost his life. He had joined the ship just before we sailed from New York on our last trip and I learned afterwards that he had made especial efforts to be assigned to sea duty on a ship going through the war zone.

Seven of the men were at work in the forward compartment just above the place of the explosion of the two torpedoes and they were either killed by the explosion or immediately drowned by the inrushing water. The other men were on rafts in the vicinity of the hole made by the third torpedo in the after part of the ship and in some way they were drawn under and did not escape.

The loss of the seven men could not be avoided as their fate was sealed when the torpedo exploded, but it is a cause for deeper sorrow and regret that the three officers and the sixteen men did not escape, as they had a chance to do so. It is sad to remember that at one minute they were there on the decks of the ship cheerful and without fear, although the ship was rapidly sinking, and almost in the twinkling of an eye the scene had changed and they were engulfed by the sea. But when the many chances of death to those in the various parts of the ship are remembered, we are thankful that the loss was not greater.

Too much praise cannot be given to Kenyon of the *Warrington* for his skillful navigation when coming to our rescue. He ran a distance of 250 miles and he so correctly allowed for our drift from the position reported by radio from the other ship that he

practically ran on top of us in our boats, a mere speck on the ocean, in the middle of a black night. And we had drifted fifteen miles from the reported position.

At daylight on June 1 we searched the vicinity for other survivors and, finding none, we began the return trip to Brest. About 1:00 P. M. another suspicious looking "sail" was sighted and the destroyer *Smith* rushed to the spot, but the "sail" was an enemy submarine and she dropped twenty-two depth charges in the hope that she might get the U-boat. There was no further evidence of the sub and we were left to conjecture as to whether this "sail" had been a sub and, if so, whether our shipmate, Lieutenant Isaacs, was on board. We were not to know the answer until five months later when Lieutenant Isaacs escaped from the German prison camp after performing one of the most thrilling individual exploits of the war. Isaacs then established the fact that the *Smith* had attacked the *U-90* and that the sub narrowly escaped destruction. The captain of the submarine had sighted the approaching destroyer and promptly dived to a considerable depth. The men at the hydrophones reported the sound of the destroyer's propellers and then they heard the depth bombs explode, followed by others closer to the sub. One was so close as to violently shake the boat and Isaacs thought the seams of the boat would open. Then the explosions appeared to be further away and the danger was over.

In the early morning of June 2 another destroyer from Brest joined us, bringing supplies of food and fuel oil for the *Warrington,* as her supply was nearing exhaustion.

We arrived at Brest about noon of that day where we received a warm welcome from Admiral Wilson and our friends who had so recently wished us "good luck" for our voyage to America.

Our sister ship, the U. S. S. *President Grant,* was there and she sailed a few days later and we gave her our hearty cheers as she quietly put to sea to take her chances through the war zone and we wondered what fortune was awaiting her beyond the headlands of Brest.

I have spoken of the loyalty and devotion of the officers and men of the ship during the hours when none knew what would befall them; the following incidents as reported to me serve well to illustrate.

Chief Petty Officer Oulette told me that he was on the rafts with a number of men and that Chaplain Whimsett was there also and that the chaplain encouraged the men to bear up bravely under their difficulties and very promptly made prayers to the Almighty asking for safe deliverance. But Oulette also said that he feared the men might become down-hearted and thought he would sing a song to cheer them up. I asked him what they sang, and he said they sang many songs but the one they liked best was "Where Do We Go from Here."

An example of courage and devotion which I shall always remember with affectionate pride was that of my steward, a colored boy named Brown. I was told that Brown was last seen with his company of men on the after deck and that he took great care to help others adjust their life-saving jackets, etc., and that, as these men went over the side of the ship, Brown walked forward on the deck. They called to him to come with them but he said, "No, I am not ready yet, I must go to the bridge to see what I can do for the 'old man'" (on board ship, the captain is frequently called the "old man,") but Brown could not come to me as the water by that time had covered the intervening deck and he had to climb over the side and in some way he was lost, but his last words expressed his devotion to what he considered to be his duty and his unselfish thoughts for others in the time of a great crisis.

The men of the *President Lincoln* truly lived and died in keeping with their motto of "Loyalty, Efficiency, and Cheerfulness."

Our ship had the honor to belong to that great part of the navy organized at the beginning of the war called the Cruiser and Transport Force of the Atlantic fleet and which was under the command of Vice-Admiral Albert Gleaves, U. S. N. This force of ships was charged with the duty of transporting our army to Europe and more than a million of our soldiers were transported by those ships under the command of Admiral Gleaves. It was to this force that all the former German ships converted into naval transports were assigned as well as many other ships and the records made by the Cruiser and Transport Force form one of the brilliant achievements of the war.

On our return to America the loss of the *President Lincoln* was announced by Admiral Gleaves in the following words:

FLAGSHIP OF
CRUISER AND TRANSPORT FORCE
UNITED STATES ATLANTIC FLEET

Mail Address
Station H, New York

From: Commander Cruiser and Transport Force.
To: Cruiser and Transport Force.
Subject: Loss of the U. S. S. *President Lincoln.*

1. It is with profound regret that the force commander announces to the Cruiser and Transport Force the loss, by submarine attack of the U. S. S. *President Lincoln* at 9:53 G. M. T. 31 May, 1918. The ship was struck by three torpedoes and sank in eighteen minutes.

2. The *President Lincoln* was homeward bound in company with the *Antigone, Susquehanna,* and *Rijndam;* at the time she was struck she was the second vessel to the left in line formation; the convoy was zig-zagging and had just completed a 20-degree change of course.

3. The ship was abandoned in excellent order, all passengers, including sick, were saved; three officers and twenty-three men were lost and one officer was captured. The small loss of life was due to the splendid discipline of the ship's company and their fine seamanship under the gallant leadership of Commander Percy W. Foote. The force commander deplores the death of these gallant seamen and extends his sympathy to their families.

4. He congratulates Commander Foote, the officers and crew of the *President Lincoln* on their meritorious behavior and desires to express his appreciation of their conduct in the face of disaster.

ALBERT GLEAVES.

I cannot close this narrative without speaking of the loyalty and devotion of the dear ones at home who with tearful eyes but set lips said "good-bye" to those who were called to meet the enemy and if necessary to offer their lives in defense of their country. Those at home prayed for the safe return of their loved ones but they prayed even more earnestly for the victory of the cause which they held to be more sacred than life itself, and it is with a feeling of great pride that I quote the following letter written by the father and mother of Floyd Hedglin who lost his life in the *President Lincoln:*

B. R. Hedglin, Cashier.

EDDYVILLE STATE BANK
EDDYVILLE, NEBRASKA

June 3, 1918.

Bureau of Navigation, Navy Dept.,
Washington, D. C.

Gentlemen:

Your message in regard to the loss of the life of Floyd Herbert Hedglin received today at 2:50 P. M.

We sincerely thank you for your promptness in advising us.

We had only one boy to give to our country and he was only a little past eighteen years of age.

He went of his own free will and accord and with our blessing.

I regret that I have only the one boy to give.

Any little detail that you can send us will be appreciated.

It was God's will that he should be sacrified on the altar of his country and we will accept His will in the matter.

I know that the boy did what he could.

Respectfully,

Floyd's Father and Mother,
/s/ MR. AND MRS. BERT. R. HEDGLIN.

What finer and more glorious sentiments could be expressed! They are truly in keeping with those of Him who taught us to pray, "Not my will, O Lord, but Thine be done."

This is the spirit of America and those heroic men of the *President Lincoln* died with this spirit in their hearts and a cheer on their lips.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SOME USES AND MISUSES OF THE MOORING BOARD

By William C. I. Stiles, Commander, U. S. Navy

I think that many an officer, when he first studies the mooring board at the Naval Academy, or rather when he is supposed to study it, is at once impressed with its resemblance to a huge spider web, contrived by the devilish ingenuity of man for the purpose of hopelessly enmeshing the poor fly—which is himself. Frequently his impression of its practical use under service conditions is equally discouraging. He sees the ship stand in to her anchorage amid a hullabaloo of ranges and bearings, which the navigator is conscientiously endeavoring to plot, his head meanwhile obscured in the chart desk like an ostrich hiding in the sand. Perhaps the ship somehow fails to reach the appointed spot, perhaps she passes it by about a hundred yards before the navigator finds out that she has arrived. In either case, if the ship has to shift berth, the tendency is to damn the mooring board as an impracticable "gadget," and to fail to criticize the manner of its use. Thus when it comes to a consideration of the less obvious maneuvering problems, he is prone to dismiss the whole matter with the assertion that, like the Peace of God, it "passeth all understanding."

Nevertheless, the mooring board, if correctly employed, is capable of giving very valuable results; but the joker is this—that it must always be considered as an aid to judgment and not as a substitute for judgment. It takes but little experience to convince a man that ships cannot be maneuvered in exact accordance with mathematical formulas and geometrical constructions. There is always some factor, such as the loss of speed on turning or the effect of the wind on the rudder action, which did not enter into the mathematical equation, but which does

decidedly enter into the practical proposition. Therefore a man cannot rely implicitly on predicted results, but must keep one eye on the board to see what ought to happen and the other on the scenery to see what actually is happening.

Nothing can replace judgment, the so-called "nautical eye," ability to form an approximately correct estimate of distances, angles, and speeds, to trace an imaginary track in the water ahead of the ship and to give the correct orders at the proper times to make her follow it. One of the values of the mooring board is that it tends to develop this judgment. The officer working the board must predict the movement of the ship and must take into consideration as many factors as he can. If his predictions fail to correspond closely to the actual performance, his attention is immediately directed to the discrepancy, and he is frequently able to discover some factor that he failed to consider, and thus to acquire specific knowledge which will serve him in the future. If, however, he maneuvers entirely by eye and fails to hit it, he is, as like as not, at a loss to know whether it was his eye or his judgment that was at fault. Moreover, if one has made a habit of studying all these factors, he will be in a position, when an emergency confronts him calling for immediate action, to form a mental picture of how the problem would look if he had time to plot it and to give a snap decision as to the approximate solution.

When speaking of mooring board problems, I think not so much of the board itself as of the kind of work involved. Such problems may be worked out on the actual board, or in many cases on a chart, or perhaps on some specially contrived "gadget." An important feature is that, whatever the means employed, the work should be done by an officer who can give his entire attention to it; and the location of the board should be such that the officer working it may have a fairly unobstructed view of what is actually going on. If it can be arranged so that the officer conning the ship can conveniently glance at the board instead of receiving verbal reports of the plotting, so much the better. Personally I think that the "Mooring and Maneuvering Board" sheets are cluttered up with too many lines which obscure and confuse the lines which you really want to see. I have never found a use for the sysem of 1″ squares and think that the radial lines might be better represented by a series of dots at

intervals of one-tenth of an inch, and the circles by dots at every degree. Perhaps the Hydrographic Office will change this some day. In the meantime the plotting may be made to stand out more prominently from the printed lines by using a red and blue pencil. These pencils are, of course, too broad-pointed for fine work, but what you are trying to produce is timely and reasonably accurate work, and it doesn't pay to be too fastidious. One thing I have learned by sad experience is this: always erase your problem immediately and completely when the maneuver is finished. Otherwise when a new signal goes up you hustle for the answer, you hastily connect up one of your points with some point you plotted for the last problem, and you give the captain a course to steer about 30° from the correct one. If you are using the red and blue pencil and get caught this way all you have to do is to shift ends and you will never make this mistake.

I have a gadget I use for maneuvering problems instead of the printed forms, locally known as the "Wegee Board," because it is supposed to predict the future and explain the past. It is a sheet of white celluloid with an 18″ circle on it graduated in degrees. At the center is the point of a thumb tack inserted from the bottom side and filed down till it barely projects above the board. This is used with an 18″ rolling parallel ruler, the edges of which are graduated to a convenient scale, with a small notch in the center opposite the zero mark. You roll the rulers till the edge takes on the tack, then you slide them lengthwise till the tack falls into the notch. Then you can swing them to any desired bearing on the graduated circle, and if the line you want to draw is not a radial one, you can rock the leading edge of the ruler till it clears the tack and walk right over the tack, to whatever point you want to go. Thus you can plot bearings and distances and run up parallel lines all with the same tool—and you have no lines on your board except those that you put there yourself. Turning circles, retardation data, revolution tables and other items for ready reference may conveniently be in-inscribed in the corners of the board.

Some navigators use the Universal Drafting Machine for plotting maneuvering problems. I have never tried this but it looks like a good scheme, particularly with the addition of a thumb tack, point up and entered from the back side of the sheet to mark the

center of the plotting, and with a small notch filed opposite the zero arc of the scale on the machine. With these additions radial distances could be plotted with the same facility as with the "Wegee Board."

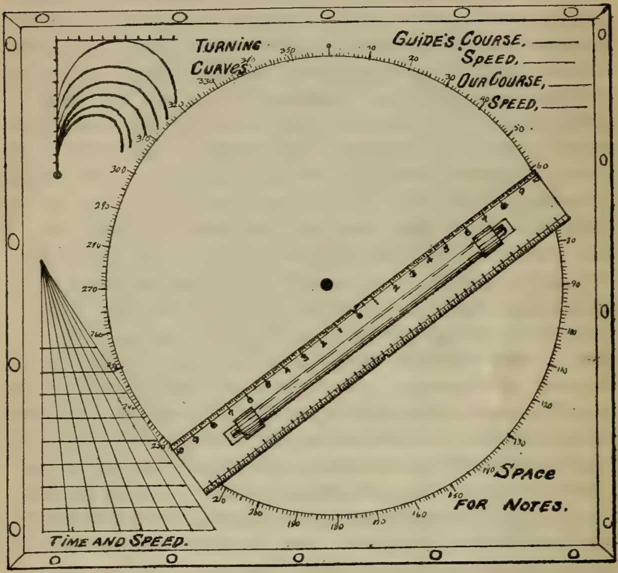

FIGURE I

Probably the simplest problem from a purely geometrical standpoint is that of anchoring on a prescribed bearing and distance from the flagship, but it has some practical aspects that are not generally touched upon in the treatises on the subject. Say you are standing in towards the Southern Drill Grounds with orders to anchor at "Point X," 1,200 yards south of the flagship. After you have made your number you send her a signal, "Unofficial to OOD. What is the bearing and distance of your anchor?" But if you are wise, you don't wait for an answer. Perhaps it may come in time and then again perhaps not. What you do is

to put your glasses on her and observe her carefully. You can make out nothing but her silhouette, but you observe one of her cranes about midway between her stack and her mainmast. If this is her port crane you are about 30° forward of her beam, but if it is her starboard one, you are the same amount abaft of her beam. Perhaps by noting the direction of the sun and observing whether her illuminated side is turned towards you or not, you can tell which. Perhaps you can tell this by the force and the direction of the wind. If it is force 3 or more, vessels on the Southern Drill Grounds will almost invariably head into it. In localities where there is a strong current this is frequently the governing consideration, and in such case the state of the tide may decide the matter for you. If none of these methods will tell you, you will have to wait until the bearing changes a trifle and note the effect on the crane. If it moves toward the stack and the other crane comes out to meet it, you are coming nearer her beam; if it comes further out from the stack you are coming nearer her bow or stern. As a result of these observations you put a pencil on the gyro repeater and rotate it till you think it is parallel to her heading and that will be it. You select as a scale of 200 yards—1″, so as not to run off the board, and plot her bow 75 yards from the center, which, of course represents her foremast.

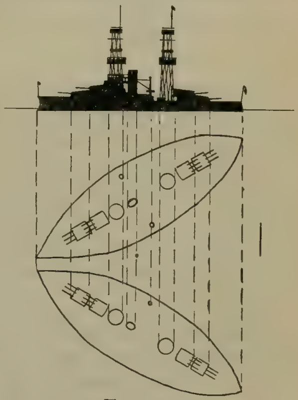

Figure 2

Now you have to figure on the distance of her anchor from her bow. Here again you consider the force and direction of the wind, and the state of tide or prevailing current. Also the amount of chain she will probably have out. Unless you have good reasons to the contrary, it will generally be safe to assume that her anchor lies ahead at a distance of about half the scope of her chain for a breeze or force of 3 or 4, and more or less in proportion.

With this assumption you plot her anchor and lay off the position of your anchor 1,200 yards due south from hers. The distance from your bridge to your bow is, say 70 yards, but you must also make an allowance for the space the ship moves between the time you say, "Let her go, sir," to the captain and the time the anchor actually strikes the bottom, rolls over and bites. I allow 30 yards for this and draw a circle with 100 yards radius about the position of the anchor. I will let go the anchor when the bridge reaches this circle, provided we have fairly good headway on at that time.

FIGURE 3

My experience has been that it makes a lot of difference whether the ship runs up over her anchor or whether she anchors with little or no headway on and drops back on her anchor with a jolt. In the first case, even the 40 yards allowance is none too much, particularly if she has a trifle too much headway on and it is necessary to snub her a bit with the chain. In the second case she may drop back to as much as 50 yards astern of the actual anchorage position before the anchor takes good hold and brings her up.

While you have been doing all this the ship is heading approximately for her anchorage. When you are still at about 6,000 yards distance or more, it will be convenient to know the exact course. Draw a radial line to the position of your anchor and on this step off a new anchorage point on a scale of, say, 1,000 yards=1 inch. This will permit you to plot your present position on the new scale and to draw a line connecting this with the anchorage point. Steer this line as a course, and if the wind or current make you sag off to leeward you will know it in ample time to correct for it. When your distance gets down to 2,000 yards you can transfer to the large scale plotting and run a new line.

If there is little wind or current you will generally head directly for the anchorage. However, with a strong cross tide or a fresh breeze, or intervening ships, it is frequently necessary to round to before anchoring. In this case it will be best to approach your anchorage on the course that the flagship is heading, so that the wind and current will not set you off the line but will simply retard your progress along it.

You should allow yourself at least 500 yards to steady up for the anchoring point before letting go. Set your course to intersect your anchorage course at this distance from the anchor, plus the 100 yards radius of your anchorage circle, plus a rough allowance for your transfer in turning.

To plot accurately the theoretical position for putting over your rudder, first lay off your transfer, according to your turning data, to the right or left of your present course. Then run back, from the intersection of this line with the anchoring course, a distance equal to your advance and from this point drop a perpendicular line on your present course.

This will give you the theoretical point for putting over your rudder, but don't rely on it too implicitly just because you have plotted it accurately. Each ship has her peculiarities which must be taken into consideration. Mine, for instance, turns rapidly into the wind, as in this case. I would stand by to correct this by easing the rudder in the middle of the turn, if it appeared necessary; or, with a very fresh breeze, I might even slip my turning point 50 or 100 yards further along the line to compensate for this feature. Don't expect to come out on the line in any case—except by good luck. If you miss it, it is an easy matter to draw a new line from the position you do come out on and steer that as a course. It is well not to attempt to plot her position too frequently. Better to get comparatively few good plots and have time to get them down properly on the board, to note the significance and to check up the progress of the ship by eye from the general aspect of things around you, than to concentrate your entire effort in trying to keep up with an over-zealous assistant navigator. Your observers should be trained to conform to your most economical speed. Moreover, they should be particularly cautioned against making too much noise. One man yelping on the bridge in an excited tone of voice can do a lot to disorganize

things by producing the general impression that a frightful emergency is taking place. Everybody has to yell to be heard above the uproar. The steersman gets nervous, the captain becomes fidgety, probably you go up in the air a trifle yourself. You make a horrid botch of the job and when it is all over, wonder why things wouldn't come out right for you.

Another point to remember is to be sure that your stadimeters are in adjustment just before you start taking distances. Somebody may have bounced one on the desk since it was last used. It is most discouraging to find out, after you think you have done a nifty job, that you are about a hundred yards out of position on account of an unlooked-for stadimeter error.

If you are coming direct for the anchorage point with a cross wind or tide, head up a little from the course plotted on the board and note the effect. It is best to over-correct for your expected leeway a trifle and keep her a little to windward of her line. Then when she loses most of her headway near the anchorage point, she will drift back on her line without changing the course.

Don't get so interested in plotting that you fail to glance occasionally at the flagship and verify her heading. You may have mistaken this at long range, or she may swing while you are coming in. Sometimes she will signal a bearing and distance of her anchor at the last minute which does not check with the position you have assumed for it. In this case quick work is necessary, but all is not yet lost. Plot a new position for her anchor, note then how this compares with the position you have assumed, and slide the position of your anchor over by a corresponding amount. Then head for that point.

It will be convenient to consult your retardation tables and see how many yards the ship will run from the time you stop your engines till the speed has fallen off to 3 knots. Lay this off from your anchorage point back along your track and it will give the position at which the engines should be stopped theoretically. It must, however, be corrected for your estimation of the effect of the wind and current, as well as for the retardation due to putting over the rudder if you have a considerable turn to make. If you have a strong head tide, you can of course approach your anchorage point at greater speed, and this will make the ship more manageable.

The critical point comes when you are 100 or 150 yards from your anchorage circle. At this point sometimes steering becomes difficult due to loss of headway and the wind and the tide tend more and more to make her sag off her line. A comparatively slight sag calls for a greater change of course to correct it. Strong measures are frequently necessary. You must remember that when the bridge reaches the anchorage circle the bow should be pointing approximately for the center of the circle. For instance, in the sketch the ship in position *A* is to leeward of her line but heading well up. If she is making considerable leeway, she may be in position *B* at the instant of letting go, and the anchor will fall on the predicted spot in spite of the fact that the bridge missed the predicted position of letting go by a matter of 25 yards.

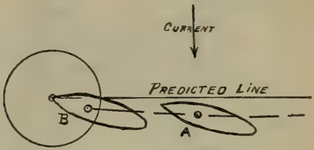

Figure 4

Coming now to the proposition of mooring, we will take as an example picking up one of the berths in North River, which we all hope to do frequently. Here we use mooring board methods, but use them on the regular navigational chart.

First lay out the position of your anchors. With 60 fathoms of chain and about 10 fathoms of water, you can allow 55 fathoms, or 110 yards, as the distance from each anchor to the center of the span. The bottom is soft mud, and if you get your anchors a little too far apart you can always drag them together enough to get the swivel on. You want a good taut moor, and, though intentionally starting an anchor from its hold is bad business, there is this litle compensation if you should finally be forced to do it—that by dragging the proper anchor, you can adjust your position a little, if necessary.

Next you lay out the position your bridge will occupy when letting go, downstream from your anchors a distance equal to the length from your anchor stowage to your bridge, plus a correction. I allow 40 yards for this factor on the downstream anchor; but on the upstream one the correction is zero, as we will be dead in the water by that time. Select two good objects ashore to take angles on; close and as near 45 degrees on the bow and on

the quarter as possible from the center of your berth. The reason for these bearings is that in case your gyro is out a bit the result will simply be to put you a trifle ahead or astern of your position, whereas if objects were selected on opposite sides of the river, for instance, an error would throw you off the anchorage line. I always check my gyro by observing ranges on prominent objects in the lower harbor and comparing them with the bearings of these objects from each other on the chart, but I notice that gyros most frequently go bolshevik when you need them most, so it is well to take no unnecessary chances.

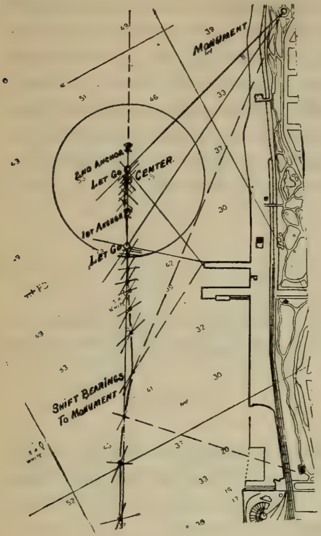

Figure 5

Get bearings on these selected objects as soon as the angle between them permits. There may be a sudden jump in the ship's plotted position when you change objects, and it is disconcerting to have this occur at the last minute. Keep her running up the anchorage line with frequent fixes, and when you are almost upon the proper bearing disregard one of the objects and observe rapid bearings on the other.

Let go when this bearing reaches the predicted amount; and when you hear the chain go out take both bearings and the ship's head, and plot the position of your anchor. If it is on the spot all you have to do is to keep her headed up the line and let go when the second predicted point is reached.

On some ships the first lieutenant lets go the second anchor without further orders when the 120 fathoms on the first chain reaches a certain point on the forecastle; but in my opinion this is poor dope. Suppose we have botched the job and let go the first anchor 50 yards to the right of the line on account of the ship's

swinging unexpectedly at the last minute. There is still a good chance to pull it out of the fire. We give hard left rudder and get her canted with the current on the starboard bow. With barely enough way on to breast the tide we will go sideways like a crab for the Jersey shore. Perhaps we may get too much chain out and have to drop back, but if we can get her into position *B* and let go the second anchor 50 yards outside of the line we will have concealed our shame. The next best thing to knowing how to do a good job is to be able to repair a botched one. The ship will then come up at the center of her berth, but the anchors will be on a line about 20° from the direction of the current.

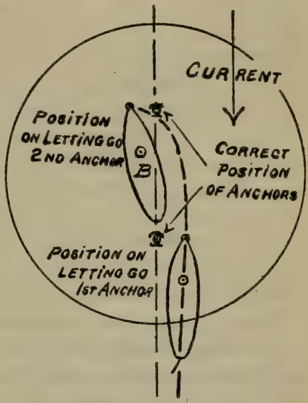

Figure 6

We now come to maneuvering problems, a subject which most frequently seems confusing to the uninitiated, but which is perfectly simple if you know what you are driving at.

The simplest case is that of ramming. Suppose we see a submarine bearing north, she submerges on an estimated course of west, at an estimated speed of 8 knots. We have 15 knots' speed available. What course must we steer to pass over her?

All you have to do to solve this problem is to remember the good old seaman's rule, "Risk of collision exists where the bearing does not change." If a vessel draws forward from us she is going to pass ahead, if she draws aft she will pass astern. If she does neither we are going to bump—that is, if nothing is done about it. Breaking out our mooring board, we put the sub at the center and plot our position due south of her. The distance in this case is immaterial. Let us suppose we are at *B* on the sketch. Now at the end of a certain length of time the sub will be at point *C* which is plotted 8 spaces to the westward of her present position. If we have steered the correct course

to intercept her, the bearing will be unchanged; that is, we will be somewhere on the line *C-D* due south from her new position. But we are going 15 knots to her eight. Therefore, while she has moved 8 spaces we will have moved 15. If we draw a circle about *B* with a 15-space radius we must be somewhere on this circle when the sub reaches point *C*. The conclusion is obvious: if we are to accomplish our mission we must steer for point *E* where this circle cuts the line *C-D*. We will have then steamed at 15 knots and the sub will have steamed at 8 and the bearing will be unchanged, so all the conditions necessary for ramming her will be fulfilled.

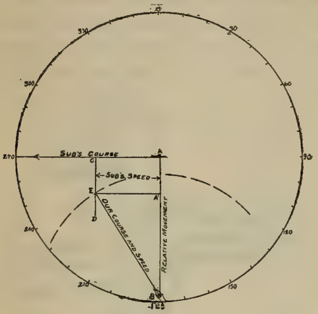

FIGURE 7

Now let us see if we cannot deduce the same result by a simpler construction. Looking at Figure 7, we see that the triangle *BA′E* is all that is really necessary to give us the answer. In this triangle *A′E* represents the sub's course and speed, *BA′* represents the direction of our relative movement, and *BE* gives our own course and speed. We can get the same results more readily by the following construction shown in Figure 8. Plot the submarine's course *A-C* exactly as before. Draw the north and south line through *C*. Draw a circle about *A* with our own speed, 15 knots, cutting the north and south line at *D* and *E*. *AE* will then give the course to ram her—and with this construction we can read it directly on the graduated rim of the mooring board. The triangle *ACE* in

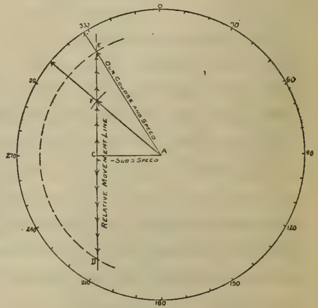

FIGURE 8

Figure 8 is exactly similar to the triangle *A′CE* in Figure 7. In both cases one side represents the course and speed of our ship, another side represents the course and speed of the submarine, and the third represents our movement relative to the submarine.

Get this "relative movement line" firmly fixed in your cranium. It is the foundation of all that is to follow. If the submarine could take bearings and distances on us during our approach the bearings would all be the same, but the distances would constantly be decreasing. If she plotted these fixes they would all fall on the line *BA* in Figure 7. In the same manner if we plotted her bearings and distances they would all fall on a north and south line. Our relative movement is north and south. This "relative movement line" is the line that gives you the dope. Every point on it gives a course and the corresponding speed which could be used with equal accuracy to solve our problem. Thus, if we take at random some point *F* and measure its bearings and distance from *A*, which in this case are bearing 310°, distance 10½, this tells us that at 10½ knots we will have to steer 310° to ram the submarine.

Let us go back a minute to the time when we drew the 15-knot circle about the center in Figure 8 and got two intersections *D* and *E* with the "relative movement line." Why did we select *AE* for our course instead of *AD*? A moment's reflection will give the answer. Both courses will give a relative movement in a north and south line; but *AE* will take us directly towards the submarine to ram it, whereas *AD* would make us diverge from it, but on a constant bearing.

A rule might be laid down covering which one of these points to select, but the best rule of all is "use the bean." If you want to ram, you know at once that you have to head across the other fellow's bow, whereas course *AD* would put her on your quarter.

Now let us complicate the problem a trifle by assuming that the range of the submarine when she disappears is between 5,000 and 6,000 yards and you want to drop depth charges on her. You have already found the course to steer; the proposition is now, how far must you go before rolling overboard the first "ash-can." Plot your present position *B* (Figure 9) 5,000 yards south from the submarine, which is at the center of the board. From here

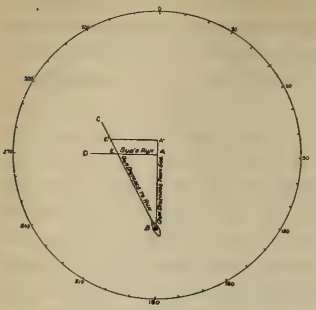

Figure 9

run a line BC on the course you have previously found and a line AD in the direction of the submarine's course. When you reach the intersection of these lines E, you will be directly above her, providing the distance was 5,000 yards, and here is where you start bombing her. If you want to know just when you will have covered her, even though the initial range was 6,000 instead of 5,000, plot A' 1,000 yards beyond A, draw $A'E'$ parallel to AE, E' will then be the point in question.

Now let us go back and see just exactly what we have done. To find the course to steer we formed a triangle (Figure 8) of which the length of one side was the sub's speed, and of another side was our speed. The matter of distances had not entered into the problem at all at this point. All the points were plotted to a scale of speeds. Therefore I call this triangle the "speed triangle." To find where to let go the depth bombs we constructed an exactly similar triangle (Figure 9) except that one side was our *distance* from the sub and the others were the *distance* we had to run and the *distance* the sub is going to make good before she finishes her cruise—we hope. This, therefore, is called the "distance triangle."

By choosing a different scale of speeds the size of one of these triangles would be altered, by choosing a different scale of distances the other would be altered, but in neither case would the solution of the problem be altered. These triangles are mutually related but entirely independent. Bear this in mind, for the most frequent error is to connect up some point that was plotted to a scale of speeds with one that was plotted to a scale of distances. When you do this you are gone.

Let us try another one now. You are in a destroyer acting as submarine screen, stationed 5,000 yards on the starboard bow of the flagship, with her bearing 110° (true). The fleet is steaming

on course 270° at 14 knots. A signal is executed, "fleet change course 45° to the right and resume present formation." You have steam for 18 knots. What course must you steer?

Under the given circumstances you should have all the present positions contantly plotted up—that is, the line *AB* representing the flagship's course and speed and the point *C* representing your assigned station. When the signal goes up, plot the flagship's new course and speed *AB′* and your new position relative to her, *C′*. Your problem is now to move from *C* to *C′*, relative to the flagship. Put your parallel rulers on the line *CC′* and transfer it to point *B′*. This is your "relative movement line," as before explained; and any point on it gives a course and corresponding speed that will take you from *C* to *C′*. The speed you actually intend to use is 18 knots. Therefore strike an arc across this line at *D* with an 18-knot radius from *A*, put your straight edge on *AD* and read your course from the scale on the edge of the board. If you want to save a few seconds make an initial guess by eye and give the order, "Right rudder new course about 350." While he is swinging you draw the two lines necessary for the solution of the problem and before he gets to the course you will be able to announce, "Make that new course 352."

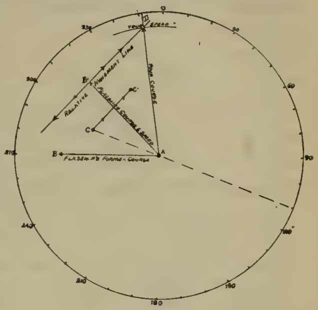

FIGURE 10

Someone may say, "What's the use? On a destroyer you wouldn't know if your actual distance was 5,000 yards or 6,000 yards. You would have to guess the distance, so why not guess the course to steer?"

The answer is this: true enough, your distance may be inaccurate, but it represents the best you can do under the circumstances. If you solve the problem accurately you will end up at the same distance that you started, but if you rely on a guess you will probably increase your error. Should you care to draw a distance triangle, as well as a speed triangle, you can find out how

long it ought to take you to reach the proper new bearing. If this is less than the time it actually took to reach it, you were too far out. By enlarging your distance triangle till it corresponds with the actual results you can find just how far you were out, and can correct your position accordingly. Thus you can get a position based, not on any form of range finding, but on the accuracy with which your ship and the flagship can hold a designated course and speed.

FIGURE 11

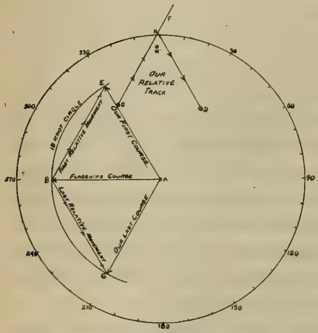

FIGURE 12

Here is one that you may get if they make your ship a division leader.

The fleet is on course west at 15 knots. Your present position is 29° forward of the flagship's beam at a distance of 2,850 yards. A signal requires you to take position 30° abaft her beam at a distance of 2,700 yards. The captain decides to make four 60° turns to drop back thus (see Figure 11) and leaves you to dope out the details.

As before, you have the flagship's course and speed *AB* and your present position *C* already plotted on the chart. The first thing you do is to plot your final position, *D*, 30° abaft the flagship's beam at the prescribed distance. How are you going to get there? Your first change of course will be 60° to the right to 330°, at speed 15. Plot this at *AE*. *BE* will then be the direction of the resulting change of relative position while on this leg. Run this line back with parallel rulers till it passes through *C*. Theoretically the ship should plot up on this line throughout the run out; she will be dropping slowly, as viewed from the flagship and at the same time increasing her distance.

When we make our second turn of 60° we will be steaming parallel to the flagship and at the same speed, and there will be no change of relative position on this leg.

We can therefore go immediately to the consideration of the third leg, during which we will be standing in on course 210° at 15 knots. Plot this course and speed *AG*. The relative change of position resulting from this course will be along the line *BG* and must bring us finally to point *D*. Transfer this line with the parallel ruler to *D*; and point *H* where it intersects *CF* will represent, theoretically, at once the finish of our first leg and the starting point of the last one. We will therefore run on course 330° plotting our positions by bearing and distance of the flagship. These plots should, theoretically, all fall on the line *CH*. When point *H* is reached we turn up parallel to the flagship and remain at point *H* during this run. When we head in on course 210° our plots should, theoretically, all fall on the line *HD*. At point *D* we again turn up on a parallel course and are in position.

We have, however, failed to take into consideration the effect of our various turning circles and the retardation we will suffer from the use of our rudder. These factors will have considerable importance on a maneuver involving as much of the use of the rudder as this one and cannot be overlooked. A study of the ship's turning data will enable the navigator to predict with fair accuracy what their effect should be, but the best results in the long run will be obtained by recording the actual change of relative position due to these turns whenever they are made and working up this data into the form of tables or of a diagram.

Roughly the effect will, of course, be to cause the ship to fall back to her new bearing more rapidly than the diagram indicates so that it will not be necessary to oblique out as far as point *H*. If I had to do it right now without previous results to go by, I would plot *H′* 400 yards inside of *H* and endeavor to turn her up on this point. Then if I come out finally slightly ahead of my position I would know that I had allowed too much and would try 300 yards the next time.

The problems thus far covered are those arising in ordinary fleet work. I will take up just one more problem to show the availability of mooring board methods to solve practically any problem involving maneuvers with reference to a moving ship.

You are an armored cruiser blockading Guantanamo from a position 20 miles, 148° from the entrance, when a lookout vessel reports "enemy destroyer escaping, now passing Windward Point heading to eastward, speed 25 knots."

You have 20 knots' speed. Can you destroy him and, if so, how?

You know that he is heading for Windward Passage, so you set your course for Cape Maysi, to head him off while working out the problem.

Plot your position on the chart at point *A*.

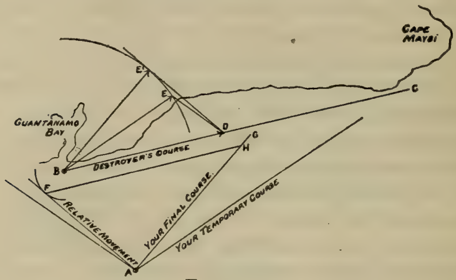

FIGURE 13

Also plot the destroyer's position *B* and probable course *BC*, which from the configuration of the land cannot be less than 78°. Along *BC* plot the enemy's speed, 25 knots at *D*. From *B* draw an arc with a radius equal to your speed, 20 knots. Now, any radius you may draw will represent a possible course and speed for your vessel. Draw *BE*, for instance, in the direction of your temporary course for Cape Maysi. The relative motion produced by the courses *BE* and *BC* will be in the direction *DE*. If you draw a line from *A* parallel to *DE*, this will represent your line of approach as viewed from the destroyer. It is going to pass astern of him. Can anything be done to improve matters? A glance at the figure shows that your course is too far to the right. If you draw *DE′* tangent to your circle from point *D*, and change your course to *BE* , you will swing the line of your relative movement as far to the right as possible. Draw *AF* parallel to

DE', and where this line passes closest to *B* will be the closest you can come to him.

There is one more thing to look out for. Will he be able to round Cape Maysi and escape to the northward before you reach your closest position? Draw *AG* parallel to *BE'* to indicate your actual tracks through the water. Intersect it at *H* with a line through *F* parallel to his course, and you will have your geographical position when you are closest to him. When you reach point *H* you will have him under fire at a range *FB* of 9,000 yards. Thus, though you cannot actually intercept him, you stand a fair chance of sinking him.

As to the availability of geometrical methods in warfare, I would like to close by pointing to the record of that well-known Greek sage, Archimedes. During the siege of Syracuse in about 250 B. C. he terrified his enemies with engines of war adapted from his mathematical studies. Later he destroyed the entire Roman fleet with a burning mirror based on the principle that the angle of incidence is equal to the angle of reflection. His end came when Syracuse was captured by the Romans in 212 B. C. They stormed the walls and came upon the old man drawing figures in the sand. Doubtless he was doping out some new scheme to put them to utter confusion. At any rate he was so wrapped up in his thoughts, he had forgotten there was a war in progress and when they asked him who he was, he merely answered, "Don't disturb my circles."

So they slew him. But right here he discovered one of the most valuable rules in applied geometry, which is this:

Keep one eye on your plotting and the other on what is going on around you.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVY YARDS AS INDUSTRIAL ESTABLISHMENTS

By Commander G. A. Bisset, (CC), U. S. Navy

It will appear later on in this article that the above title is in the nature of a screen. The real subject of the article is the maintaining of matériel.

General Order No. 53, which provides for industrial managers at all navy yards, under the commandants, effective July 1, 1921, brings up again the question of organization of navy yards. In this connection, it may be that the following conclusions resulting from fourteen years' navy yard experience under fourteen commandants may interest the readers of the Institute.

Who is so wise as to be able fully to know all things?

Five hundred years ago one of the world's deepest thinkers, Thomas à Kempis, in the above words expressed his virtual agreement with the consensus of modern opinion that "no one man knows it all."

In spite of this belief that goes back to antiquity, there is prevalent, to an astonishing degree, a feeling in the line of the navy that all naval activities should be under the control of the line. While conceding to the line the leading rôle in the navy, it is manifest that the best results cannot be obtained by subordinating the activities of the other corps to the line. The best line officer in the service would make a very poor surgeon, unless he has had training that he does not get as a part of his regular duties. Similarly this A1 line officer would make a poor naval constructor, although his regular duties do make him more or less familiar with the finished product manufactured by the naval constructors. Knowing how to operate the engines, navigate the ship, and handle the guns is an entirely different profession from building the ship—just as fabricating the plates in building

the ship is an entirely different proposition from converting iron ore into the steel plates from which the ship is to be built. Placing a naval hospital under the command of a line officer would be on a par with placing an industrial plant at a navy yard under such command. It would be just as reasonable to make a paymaster gunnery officer of a ship, or a marine officer, supply officer of a navy yard. While each might succeed in the unusual job, success would certainly cause comment—a sure proof that it was unexpected. While General Order No. 53 institutes a very great improvement over previous conditions, it doesn't go quite far enough. It is necessary to face the issue squarely. In mounting a stair one must raise one's foot the height of the step to get ahead. If one raises it only halfway one lands where one started. It is believed to be dodging the issue to make line officer commandants of navy yards heads of the industrial activities of the yards.

Good results should be obtained by a naval constructor manager under a capable line officer commandant who has a proper appreciation of his position and doesn't undertake to do the manager's work for him. If, however, there is a line officer manager the condition is changed. He is just so much "insulation" between the commandant and the yard—just so much insulation, also, against efficiency. While the commandant has as his "cabinet" the captain of the yard to look out for military matters, the supply officer for stores, and the yard surgeon for health—all specialists—he is practically without help in connection with industrial activities, the most important of all, as the manager is no more of a specialist in these matters than the commandant himself. While, therefore, in order to be assured of a successful administration, the commandant should have a manager with vast experience in all the thousand and one problems of an industrial yard—employment of labor, civil service rules, planning systems, drafting rooms, shop organization, yard equipment, plant maintenance, transportation system, care of loose and hand tools, operation of power houses, etc.—he must, in the case under discussion, get along without this expert adviser. A man with a navy yard experience of fifteen years or so is familiar with navy yard "history" and will not make nearly so many mistakes as the less experienced man and will know the answer to many a problem that the other

will have to work out himself with a strong probability that the answer he gets is not the correct one but had been tried before and discarded. A line officer may be rewarded for some specially meritorious work at sea by being made industrial manager at a navy yard. If he understood the requirements of the position and the probability of his losing such reputation as he had acquired he would scarcely think of accepting. Even if seagoing should some day become popular, it is impossible to conceive of a naval constructor's accepting a position as executive officer of a battleship as a reward for his having done good work in connection with its construction. No one would realize better than the naval constructor that the last fifteen years' experience that had made him a capable naval constructor had removed him that much further from fitness for line duties. At that, the chances are in his favor, as he once performed line duties while the line officer manager never performed construction corps duties.

The monthly pay of officers attached to an average navy yard will probably be about $25,000, that is, $300,000 per year. Considered as an industrial plant it is evident that $300,000 is a terrific overhead, bearing in mind the output of an average yard. A private plant of the same capacity would probably have fewer than one-fourth the officials. Navy yard organizations show small return for the outlay, with many high ranking officers performing only nominal duties. At one of the smaller yards recently there were forty-four commissioned officers in the industrial department. When we go down the line in the navy yard organization, until we find the man that really does the work of an industrial manager, we are liable to find that besides all the problems he has to solve that legitimately belong to a manager (and there are plenty) he is burdened with many unnecessary troubles due to the nominal managers ahead of him to whom he must explain every contemplated move and persuade them of its necessity before he can go ahead. The nominal manager may get along all right if recommendations come to him approved by all concerned, but if his advisers disagree he is in a quandary.

It is believed to be literally true that there is no such thing as an efficiently operated government-owned industrial plant. The causes of this condition are fairly numerous but the main causes

are few and readily understood. While, perhaps, most people attribute unsatisfactory results to graft this is totally lacking in the navy, to which this article particularly refers. The worst charge that can be made against individuals is well-meaning incompetence.

In a democracy, where each person has an equal "say" in the government, it is clear that those people that know something about industrial management (or anything else) are vastly outnumbered by those that know nothing about it. The natural inertia of mankind makes this majority slow to make any changes.

It is purely accidental if the majority of the people of a democracy ever do anything well, such as elect the best men to high offices. The majority is always ignorant and uninformed and swayed by anything but reason. The intelligent and progressive always constitute a small minority—the greater the intelligence the smaller the minority.

In a large unwieldy democracy, correcting anything that is wrong is a long tedious process—it takes so long for the small minority that "knows" to instruct the vast majority until sufficient public sentiment is created to force the change. Moreover, of that small minority few have the public spirit or incentive to undertake the huge task of educating the masses. The large democracy is liable therefore to meet the fate of the great pachyderm that sinks further into the mire that is made more fluid through its own frantic efforts to emerge.

A man who has sufficient skill as a politician to become Chief Executive of the democracy could hardly, unless he is a superman, be also the man best qualified to be business manager of the country, nor is he apt to select the best department heads (looking at the matter mathematically).

Assuming that the chance of the best business manager's becoming Chief Executive is one in one thousand (very optimistic) and the chance that he will select the best department heads is one in one hundred, the chance that in November of every fourth year we shall get the best possible department heads is only one in one hundred thousand. In other words, it is practically a mathematical certainty that we shall not.

It would seem, then, that the moves for the betterment of the service must come from the service itself rather than from an

executive. It behooves the service, therefore, to enlighten itself. Hence, everyone with a few meager candle-power should contribute his quota so that eventually the illumination will become general.

The work that is being done at the War College at Newport for the fighting branch of the service is of incalculable value. Surely this institution is not paralleled in any country in the world. Certainly the instruction there received can not otherwise result than in bringing our line officers to the very pinnacle of fighting efficiency. With these officers and suitable matériel, the country may rest secure behind the first line of defense, the navy.

Suitable matériel—there is the rub—matériel efficiently constructed and efficiently maintained. Matériel may win or lose a battle or a war. Defective powder in a shell that lodged near the sternpost of the *Kearsarge,* causing the shell to fail to explode, probably saved the *Kearsarge* from sinking rather than the *Alabama*—the difference between victory and defeat.

Or, to quote from more recent experience, the inferiority of English matériel, in defensive qualities, resulting in three battle cruisers being utterly destroyed by gunfire at the battle of Jutland while no German armored vessel was similarly destroyed, would, in the case of a foe of equal or nearly equal strength, have caused the loss of sea dominion to England.

Does our matériel compare with our personnel? Sadly—no!

Our matériel and our personnel should meet on that "pinnacle of efficiency."

While the construction of our matériel is fairly satisfactory and may compare favorably with that of foreign countries, it should outclass these countries to the same degree that our personnel does. After the construction of our matériel comes the perhaps more important consideration of maintaining it in the most efficient condition through repairs and alterations.

The excuse for this article is the subject of *maintaining* matériel in the most efficient condition. Maintaining matériel—that is the fatal weak spot in our service armor—that is the mortal disease from which we are suffering. There seems no hope of a cure; the doctors disagree, so the patient dies.

Otherwise reasonable people seem unable to see reason when the question of organization or management of navy yards is

under discussion. Probably few seagoing officers give the matter serious thought, imagining perhaps that their ideas will not be asked for by those with power to make changes. My experience is that the run of ideas of seagoing officers relative to navy yards is chaotic, unfixed and unfriendly. They rarely miss an opportunity to make a dig at a navy yard, evidently being convinced that the naval constructors are responsible wholly and entirely for the situation they mention.

Naval constructors are human and therefore prone to err. They make their quota of errors. These errors become rarer and rarer, however, as they gain experience in navy yards, until after many years' experience and their becoming construction officers, their course is practically clear of such impediments.

At this stage in his career the naval constructor is liable to find himself confrere with an engineer officer doing his first, or, in rare instances, his second tour of duty in a navy yard. Seagoing is now such a grind that it is really imperative for an officer's shore duty to be something of a relaxation. On his first tour an officer realizes that a navy-yard job is anything but a relaxation and many seldom seek a second tour. This confrere will therefore be passing through the same error-making stage that the construction officer passed through some ten years previously. This engineer officer goes after two years or so, and another comes and passes through the same phase, etc., etc. As naval constructors may have twenty-five years' service as construction officers at navy yards (not to mention their experience as assistants in the hull division) it may be expected that their nerves will become shattered from such a long infliction of association with "maky learn" engineer officers. Many vexatious disputes are bound to arise, disputes refereed by a possibly "maky learn" commandant who too frequently sides with the engineer officer because "the line is the thing."

Usually the largest shop in the yard is the machine shop, a large percentage of the material used in the yard passing through this shop at some stage. This shop is in the machinery division. The shop superintendent machinery division is usually a young officer doing his first and only navy yard tour. Without any equipment whatever, he is injected into the position of boss of the largest shop in the yard. As the output of the yard as a whole

depends very much upon the machine shop, one doesn't have to be one of the three wise men to know that the output of the yard is bound to suffer. The shop will merely turn out what the civilian supervisors with their limitations are able to turn out. They are practical men who need and are entitled to get from the shop superintendent technical guidance. The chances are, moreover, that the shop superintendent can get no help from his boss, the engineer officer, who in all probability never was shop superintendent himself. They are both in the position of having to make decisions without having the knowledge of how to decide. After two years when the shop superintendent is detached, he has learned enough about the shops, if he is diligent, to be of some little value. He is then replaced by another young officer who goes through the same instruction period. Thus the shop is a school. The officer doubtless benefits from the schooling; the machine shop certainly cannot, as it has been obliged to get along all the time without a real head. While this schooling has some value, obtained in this way its cost to the Government far exceeds its value. Moreover, the schooling would be far more beneficial to the young officer himself if, instead of serving as shop superintendent, he served as assistant shop superintendent under an experienced shop superintendent.

In the latter case he is learning from a teacher, in the former he merely learns what he can pick up by himself. In other words, not only does the officer benefit but the Government does also—an officer is given good training in shop work without expense to the Government instead of poor training at heavy expense.

The hull division has better shop superintendents than the machinery division. With at least equal initial intelligence and more experience they are bound to be better. Moreover, in the case of the hull shop superintendent, the shops may be his one great consuming interest in life. The knowledge he gets in this position will always be of vital use to him.

At one yard, under normal conditions just before we entered the war, patterns made for one ship by the machinery division cost twenty-seven hundred dollars ($2,700.00). Plans of these castings were sent to an outside concern for quotations. They quoted seven hundred dollars ($700.00)—practically only one quarter the cost in the yard. It is seldom possible to get direct

comparisons of cost such as the above. It is believed, however, that in practically every yard work done in the machinery division will cost much more than it should. In other words, much of the appropriation for repairs expended by the machinery division is wasted. In still other words, much more repair work could be done with the same appropriation if the work were done efficiently.

Some years ago the old ordnance department of a navy yard desired to draw from Store No. 1 white pine sixteen inches wide and sixteen feet long—nothing else would do. Such wide lumber being particularly rare and expensive, inquiry was made as to the purpose for which it was desired. It was wanted to make transportable rifle racks which are eight inches wide and four feet long! These racks had been costing ten dollars ($10.00) each. The Portsmouth yard now makes them, thanks to the skill of naval constructors, for about one dollar and sixty cents ($1.60) each.

The naval appropriations have recently been cut to the bone. Thousands of men are being discharged from navy yards. The navy seems to be driving on a "lee shore" without the wherewithal to "claw off." Such small funds as are available for upkeep of the fleet should be let out of the strongbox with grudging care only upon the strongest guarantees that each dollar buys the maximum of repairs—not just twenty-five cents' worth, or fifty cents' worth. Is any naval officer so short-sighted or is his patriotism of such a brand that he prefers half a navy, so long as repairs are controlled by the line, to a full navy kept in repair by the constructors? The case is similar to that refereed by King Solomon where the false mother preferred half a dead baby to surrendering the whole live one to its real mother. It is absurd to imagine that any naval officer prefers a half navy to a full navy. All merely want to be "shown." Would that the Lord repeat His creative act of the third (?) day of the creation when He said, "Let there be light."

Very recently a number of battleships were at a yard for repairs. Workmen and facilities were available to complete the repairs in record time. What happened? The appropriations, rigidly limited by Congress, were so low that after the clerks and draftsmen and other overhead expenses had been paid, very

little was left to pay for labor. Consequently, instead of staying at the yard about two months these vessels had to stay nearly six months, waiting until the monthly allotments totaled enough to pay for the necessary repairs. During all this time there was being wasted, through inefficiency, Government funds that could have been used to advantage to effect earlier completion of these repairs. A little insignificant looking barometer indicates the approach of a ship-wrecking storm. Likewise, at the yard in question, one little item where a comparison was obtainable indicated where to look for leakages of real moment where comparisons were not readily obtainable. This little item was the cost of upkeep of air tools. The hull division for a considerable time had been oiling and making minor repairs to its own air tools, accurate records being maintained to ascertain the cost of the work in detail. Even the unit cost per tool was available, labor and material separately. "Proper authority" directed that the upkeep of hull division air tools be handled by the machinery division. Accurate records showed that after this event the labor cost of upkeep, per tool, reached as high as four times the previous cost, the total excess over the previous rates amounting to $5,000 in six months—practically $1,000 a month—enough to keep several destroyers in repair.

Of the two types of economists one says, "figures never lie," and the other, ironically, "you can prove anything by figures"—directly opposite viewpoints.

The above figures are the kind that do not lie and they prove a lot! Moreover, after expending so much on upkeep, the machinery division did not keep the tools in as satisfactory condition as formerly. Machinists couldn't be expected to know as much about when an air hammer is in satisfactory condition as a riveter or a chipper and calker.

Just as on board ship surgeons are selected from all the officers on board to do surgical work because their experience, education, and training make them most suitable for this work, so at shore stations should managers of the industrial plants be selected from the corps of naval constructors, for identical reasons.

Moreover, to carry the analogy further, just as at naval hospitals a surgeon is selected to do the operating work on account of special fitness for this particular work, so from the

construction corps should be selected for industrial managers only those that are particularly fitted for such positions. Most members of the construction corps are distributed over three main classes of work; navy yard work; shipyard work, as superintending constructors; bureau work. Each member of the corps is best fitted for one of these three positions. In fact, it may not be exaggerating to say that some are totally unsuited for one or two of these jobs. It is manifestly undesirable for a man to be given a job for which he is not suited. The man suffers and the job as well. Selection has a legitimate field when made use of as indicated above. There are some constructors that should never be assigned to navy yards jobs in charge of a large number of men and in contact with numerous others, including officers attached to naval vessels. They are temperamentally unsuited for such jobs. These same men may be incomparable on a shipyard or bureau job.

The corps of constructors is now large enough so that it also should have a "finishing school" like the War College where the special talents of the individuals may be ascertained and developed. They should be required to specialize. Once a man's specialty is determined, he should be given the opportunity to make a thorough study of it under competent instructors. Such a method would be far better than learning by mistakes, as at present. It is not intended to infer that the present method is the deliberate choice of those in authority. They have no alternative on account of the large amount of work to be done by a very limited personnel. To the writer, however, the situation appears now to have clarified to such an extent that the above suggestions are in order.

Eventually, therefore, there should be available in the construction corps, industrial manager specialists of whose qualifications even the most carping can have no real doubts. These specialists, trained in the same school, should have similar ideas as to organizations, systems, methods, etc. When, as at present, the seagoing officers find a different system at each navy yard they visit they may be pardoned for doubting the efficiency of any one of them. It is self-evident that one of the various systems must be better than all the others. The new scheme should provide

the machinery for ascertaining the best "system" and making it universal.

With the Utopian arrangement indicated above, when necessary to fill a vacancy in the industrial manager position at a yard, an industrial manager specialist of known ability would be selected, as distinguished from the present system of filling vacancies approximately by seniority.

Although criticism is always necessary so that defects may be corrected wherever they are found, in order that perfection may be approached, no one should deny to navy yards their mead of glory. What they accomplished during the war in spite of inconceivable handicaps was most praiseworthy.

Perhaps the worst handicap under which they labored was the civil service commission. Let us hope that in our next war the enemy will not find as strong an ally in our civil service as he did in the last war. While this statement will surprise many, numerous co-sufferers will recognize the justice of it. This so-called "service" was, in my experience, of no service whatever. To discuss the civil service fully would require an article in itself. May it suffice here to express the hope that the civil service will be ejected from navy yards bag and baggage—until such time as an economy or efficiency commission has investigated thoroughly the civil service and obtained remedial legislation that will convert the civil service from an obstacle to a service. It is only fair to add, however, that with the laws as they are, even the best administered civil service would still be a nuisance.

In looking over the above paragraph I find I have made a charge without a specification. I cite one. In March, 1917, at the Puget Sound navy yard, it was found necessary to obtain ship draftsmen for the large amount of work in prospect. With numerous new shipyards all over the country it was impossible to obtain real ship draftsmen at the rate of pay provided at navy yards, particularly when in order to obtain a satisfactory rate of pay he must meet civil service requirements that had been prepared for peacetime use. It was necessary, therefore, to pick up the best men obtainable and give them temporary appointments subject to non-competitive examination. One draftsman so obtained in March or April, 1917, submitted his non-competitive papers to the civil service commission. In May,

1918, he received notice from the civil service commission that he had failed to pass his non-competitive examination and must be discharged at once.

In the meantime this draftsman had acquired a year's experience as a ship draftsman and was therefore much better qualified than almost any man we could find at that time for a position in the drafting room. In fact, at that time men were being taken on every few days for drafting work that had nothing like the qualifications of the man in question. While it is difficult to conceive of anything more absurd than the above action, the civil service commission was guilty of many other things almost equally absurd.

Great savings are possible at navy yards. These possibilities are by no means confined to the machinery division. Although in hull divisions gradual improvement is being made in methods and processes, eliminating waste, a vast amount of further eliminations is possible. Any item of expense attacked with the idea of reducing the cost is sure to yield gratifying returns. It is essential that the burden of these attacks be borne by the officers, however, as the foremen and mechanics are too busy with routine matters for them to be of material assistance in this work. As examples of what can be done in this way by study, a few instances are cited, as follows:

The squilgee is an article familiar to all naval officers. In attempting to reduce the cost of manufacture of squilgees, and at the same time make them more suitable for the purpose for which they are used, the following was noted.

The type of squilgee in use at the time the study was started had a groove for the rubber blade with equal thicknesses of wood on each side of the groove. These wooden "legs" were also of equal length. The rubber blade was held in by screws. It was found that the forward edge of the groove was badly worn by contact with the deck when too much pressure was brought to bear upon the squilgee when operating it. For this same reason, that is, too much pressure, most squilgees failed by the splitting of the wood at the back of the groove, that is, the wood of the rear leg. The squilgee was strengthened by making the wood of the squilgee thicker, this increased thickness being taken by the rear leg, reinforcing it against splitting. The forward end was

shortened by about one-quarter inch and chamfered so that it would not come in contact with the deck. Nearly four-fifths of the cost of the completed squilgee was the cost of the rubber blade, the highest grade rubber being used. Cheaper grades of rubber were tested, more "compound" being in the cheaper grades. It was found that a satisfactory blade could be obtained for sixteen cents instead of forty cents as formerly paid. In place of the screws, rivets were used, which, being hammered up, brought the wooden sides of the groove tightly against the rubber blade, giving a much stronger squilgee than obtainable when screws were used, screws not drawing the wooden legs against the rubber at all. The net result of the investigation was that a far better squilgee was obtained at about one-half the previous cost.

A much more sensational accomplishment was done in the manufacture of hammocks, the prime consideration being the manufacture of these hammocks as quickly as possible. Through improvements in the sewing machines, all these improvements being designed by the yard, a female employee was able to work the eyelets in ninety-seven hammocks in an eight-hour day when formerly first-class sailmakers had turned them out by hand at the rate of eight per day.

Referring to the question as to whether or not the existence of navy yards is warranted, it will be well to consider the expenditures for the navy during 1920 as taken from the annual report of the paymaster general.

Total expenditures during 1920	$1,078,000,000.00
Operating expenses of the fleet	203,000,000.00
Repairs to ships and equipage and alterations	39,000,000.00
Maintenance of navy yards	172,000,000.00
(Of this amount only $78,000.00 was for maintenance of navy yards [industrial].)	
Improvements to navy yards	87,000,000.00
Cost of output of industrial yards	303,000,000.00
(Includes new construction.)	
Property investment of naval establishment, total	2,911,000,000.00
Ships	1,292,000,000.00
Stations	534,000,000.00
Stores	1,085,000,000.00

Upon analyzing the above figures it will be observed that the repairs and alterations to vessels constitute only 4½ per cent of the naval expenditures; that the maintenance of industrial yards amounted to 7.2 per cent of the total expenditures; that improvements to industrial yards amounted to 5½ per cent.

It is clear from the above that the claim sometimes advanced that all the money appropriated for the navy goes to pay high wages in navy yards is not justified.

As the value of shore stations is 41 per cent of the value of the ships, why not dispose of all the shore stations and put the money derived from them into ships, increasing the navy by 41 per cent? In order to answer this question it is necessary to demonstrate that navy yards are or are not indispensable. It is customary in a discussion of this kind for each of the participants to start with a theory of his own, effort being directed towards finding facts to prove his particular theory. This case is similar. One is not accustomed to preparing a defense for navy yards, as one has been accustomed to their existence as a regular institution. Upon looking around, however, it is not difficult to prepare a defense for them.

In the first instance, every nation that has a navy that amounts to anything also has navy yards. It would appear, therefore, that if navy yards are to be dispensed with, the onus of proving that they can be dispensed with is on those who desire to make a change.

However, waiving this point, with the fleet repairs scheduled as in the United States, so that the absence of vessels from their regular stations for repairs will be minimized and absolutely according to pre-arranged schedule, it must be apparent to anyone that to have these repairs done in a shipyard would be out of the question. Navy yards being under the same military authority as the ships, their operation is under the absolute control of the secretary. On the other hand, in dealing with private shipyards, all repairs and alterations would have to be covered by written contracts. If the contracts are prepared with the usual governmental care, the repair period would be over before the contract would be signed. Moreover, as repairs proceed, the necessity for additional repairs becomes evident. To cover this additional work, no end of complications arise. It is evident, in the first

place, that in allotting the work it will be necessary to obtain bids from all responsible shipyards available. It is evident, moreover, that on account of the uncertainty of all repair work, the price bid will be ample to cover every contingency. That there is tremendous profit in repair work is evident from the fact that the most prosperous shipyard in the United States confines itself to repair work only. It will take no new construction work whatever. While, from new construction, direct comparisons can be obtained between the cost of the work at navy yards and at shipyards, the cost probably being ordinarily in favor of the shipyards, if there is left out of consideration the military feature of keeping the navy yards in good condition for repair work by having new construction work done there, no such comparison is possible in repair work. Repair work in private plants would undoubtedly cost very much more than in navy yards. Moreover, as private plants could not be expected to keep on hand such a large quantity of stores as the navy does—over one billion dollars' worth—the time required for repairs would be increased by the time necessary to obtain material. To shorten the time of delivery, heavy bonuses would have to be paid. Besides, private firms cannot purchase so economically as the Government and they haven't the machinery for inspection that the Government has, this machinery insuring that the material purchased meets the specified requirements. In war, the Government would have to take its chances, along with private shipping companies, in obtaining the services of the shipyards.

It is clear from the above that navy yards are indispensable, that they cannot be disposed of in order to buy ships with the proceeds.

There are many good reasons why there should be navy yards —there are equally good reasons why they should be operated at maximum efficiency; to save the taxpayer or to give us more navy for the same expenditure. Red tape will always handicap navy yards, very much in the way that parliament used to handicap kings and the law still handicaps crime.

"Red tape" is that system in which a man is prevented from doing a thing in the most direct manner through the necessity for conforming to various rules and regulations of higher authority or to the law. Many of these rules, regulations, or laws are

thoroughly justified, others are out of date. It would be absurd, for instance, to use steel for naval construction that had not been inspected—that is justifiable red tape. It is equally absurd to be governed by an old law that states that in making repairs to vessels, if the estimated cost exceeds $3,000, no work shall be done until after it has been recommended by a board of survey composed of various officials, totaling about ten. At the time the law was enacted, $3,000 was probably 1 per cent of the cost of the largest vessels known. Against this figure today would have to be set over $300,000. While much out-of-date or unnecessary red tape could and should be dispensed with, a red tape check is absolutely necessary in any governmental institution.

The last annual report of the paymaster general is about five inches thick. While it contains much information of undoubted interest, it seems hardly possible that its value can compare with its cost. What would be of greater interest would be figures making possible a comparison of the efficiencies of the different yards. Practically the only figures available for comparison now are percentages of general expense and indirect expense. These figures not only mean nothing but are liable to create a wrong impression in the lay mind. What counts, of course, is the total cost of the work regardless of how this total is divided between labor and indirect expense, material costs being practically unaffected by management.

Included in the industrial costs that should be available for purposes of comparing the different yards are:

Electricity per kilowatt hour; total amount consumed per year; total cost; percentage of the total cost to total of the payroll for the year of the yard employees.

Steam per pound; total produced per year; total cost; percentage of payroll.

Air per 1,000 cubic feet of free air; total produced per year; total cost; percentage of payroll.

Heat per pound of steam; total produced per year; total cost; percentage of payroll.

Hydraulic power.

Total power-house costs per pound of steam produced; quantity and cost of fuel used per pound of steam produced; ratio of total payroll of power-house employees to number of pounds

of steam produced during the year; percentages of total steam produced used: to generate electricity; for heat; to compress air; for blacksmith shop; for other power purposes.

If air is used for steam hammers give cost in suitable unit for comparison with cost of operating steam hammer in yards using steam.

Foundry costs per pound for brass, iron, and steel castings and total weight manufactured during the year.

Costs per pound for galvanizing iron and steel; total costs for year and total weight of zinc consumed and total weight of metal galvanized.

Cost per pound or cubic foot of oxygen manufactured at yard during year; total amount and total cost for year and comparison of total cost with total yard payroll. Same for acetylene gas.

Total cost of oxyacetylene welding; total weight of welding metal consumed; percentage of second to first.

Total cost of riveting for year; total direct labor only, total value of output on piecework basis (same piecework schedule being used for all yards for comparative purposes); total riveting hours for year; ratio total riveting hours to total value on piecework basis; total maintenance cost of tools; average maintenance cost per tool.

The above items give an idea of comparisons that should be obtainable among the different yards. The list should be extended to include transportation, cranes, locomotives, etc., as well as practically every activity where a basis for comparison may be found.

In order that the comparisons may be of value "out of pocket" costs only should be used. It is unreasonable for one yard, say, to be charged with depreciation on a plant ten times as large as it may be using for current work—the nine-tenths unused is a military feature—provision for war.

It is hoped that the candor of this article will give no offense as none is intended. I am merely acting upon my theory that to obtain the right solution of any question in dispute, the proper procedure is to keep nothing in reserve but to state the entire case as it seems to the disputant. Nothing would be gained by minimizing the points at issue, agreeing on these and leaving the major items unmentioned to fight about in the future.

In General Order No. 55 the secretary of the navy has stated the necessity for economy and placed the situation up to the officers of the navy. He has made the first move—it is now our move. Shall we fail the secretary and the navy?

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

MILITARY CHARACTERISTICS AND ORDNANCE DESIGN

By Commander H. F. Leary, U. S. Navy

1. The General Board having prescribed in general terms the military characteristics of a ship, such as type, speed, radius of action, armament, armor protection, etc., for any type of new construction, the various technical bureaus, upon approval, and under the direction of the Secretary of the Navy, proceed with the development of the plans. Preliminary or basic designs of the vessel are prepared by the design section of the Bureau of Construction and Repair, and the various other technical bureaus are requested by that bureau to furnish data regarding features of design under their cognizance for incorporation in these designs. The Bureau of Ordnance is requested to furnish preliminary designs or type general arrangements of ordnance equipment, together with weights and centers of gravity of all ordnance material to be carried by the vessel, and to submit general recommendations regarding armor protection. In order that this information may be available and be furnished without delay, it is necessary that the trend of ordnance design be anticipated to a great extent by the bureau.

2. The preparation of designs for turret, secondary battery, or anti-aircraft mounts, torpedo tubes, etc., are undertakings requiring six months to a year's time. The information required by the Bureau of Construction and Repair is generally furnished within a week or two after the request is made, and the design must be sufficiently worked out in advance to furnish at least reliable preliminary data regarding weights and dimensions. Ordnance design is constantly undergoing a process of evolution and systematic development, due to increase in caliber and power

of guns, to the development of new weapons and instruments of warfare, and to the constant efforts of nations to produce types of vessels possessing offensive and defensive features superior to those developed by others.

3. Generally, work of basic design is done by several experienced men in such a manner as to cover the requisite features with accuracy, with the least detail possible and with the least expenditure of time. The governing idea is the determination of the important features of the vessel, after weighing all the possibilities and their various relationships, both to the design itself and to each other. Once this is accomplished satisfactorily, the necessary sketches made, and the data tabulated, the work of developing more detailed plans may be at once undertaken with efficiency and assurance. Aside from the element of loss of time and money due to unfortunate selection of characteristics proposed, the main advantage to be anticipated from the organization of a basic design section is the facility with which it is possible to investigate the effect of variations in dimensions, power, capacity, etc., without occupying the time of the regular drafting force or being embarrassed by relatively unimportant detail. The value of such a section was first formally recognized in the Bureau of Ordnance during the war, and since then all departmental designs have been handled by it, and the results have been such as to establish this system firmly. The caliber of main battery guns of battleships of the leading nations has increased 50 per cent during the past ten years, and in the same period of time the submarine and the flying machine have been perfected; and, by their advent, warfare has been extended into the air and below the surface of the sea.

4. To be prepared to meet the demands of the General Board and the Bureau of Construction and Repair, and to keep up with the progress of ordnance development referred to, it is necessary that improved types of ordnance design be under constant investigation by the Bureau of Ordnance. The main subjects to be investigated and covered by this bureau in connection with the design of capital ships are the questions of caliber of main battery guns and armor protection, both of which are largely dependent upon the assumptions made as to the probable future battle range.

5. Assume, for instance, that we have reason to expect a large increase in battle range, due to improved methods of fire control and increased accuracy of guns. In such a case a complete study and estimate of the situation is undertaken by the Bureau of Ordnance. Let us suppose, as a result of this estimate, that it is decided to investigate the use of the 18″ gun for future capital ship construction. Orders are issued by the Chief of Bureau of Ordnance to the design section to proceed with the design and preparation of the necessary preliminary drawings for the gun, projectile, turret, and other features making up a complete unit. The first step undertaken is the preparation of a preliminary design of gun. The weight of the projectile is tentatively decided upon in order that the ordnance engineer in charge of gun design may have a starting point from which to work. A careful survey is made of the problem to determine the muzzle velocity required to give the desired penetration at the battle range under consideration. Weight of projectile and muzzle velocity being determined, consideration is next given to the problem of interior ballistics. From records of past gun performances and other information available; a powder is selected that will give the desired velocity to the projectile without exceeding normal chamber pressures and give the greatest number of foot pounds of work from each pound of powder in a gun of 45 to 55 calibers in length. For obvious reasons, it is desirable to use existing powders. When this is not possible, the powder expert at the Naval Proving Ground is consulted and a new powder is tentatively selected, of such web thickness as to give the desired rate of burning.

6. The principal characteristics of the gun having been determined, the next step is to prepare a general arrangement drawing. This drawing shows the powder pressure curve, velocity of projectile curve and the strength curve, together with assigned skrinkages and all necessary dimensions. No effort is made at this stage to prepare detail drawings. These, together with all other manufacturing drawings, are prepared by the Naval Gun Factory from the general arrangement drawings furnished by the bureau, when orders are issued to proceed with manufacture.

7. As soon as a decision is reached regarding the weight of the projectile, this data is turned over to the engineer in charge of projectile design, and this work proceeds simultaneously with the

gun design. Until very recently, little was known regarding the important principles entering into projectile design. Projectiles were designed that were strong enough to stand the heavy pressures in the gun without breaking up and which gave satisfactory results from the standpoint of armor penetration. Little was attempted, however, in the design to produce a projectile which would give the most satisfactory results as regards dispersion. From what has been developed during the past two years, it has been found that by observing certain principles of design that are concerned principally with obtaining the proper relation between rotation, moment of inertia of the projectile about the longitudinal and transverse axis, combined with proper band design, the dispersion may be greatly reduced below that obtained in the past when these features were not carefully considered.

8. The features of gun and projectile design having been determined, it is customary to proceed with the manufacture of a type gun and slide, in order not only to prove the important features of gun and mount design but to initiate experiments at the Proving Ground dealing with powder, armor penetration, and accurate ballistic data. Use is also frequently made of wooden models of turrets, guns, and mounts built full size at the Naval Gun Factory.

9. Upon completion of the preliminary plans of the gun, and without waiting for the completion of the type projectile, gun, and mount, the design section of the bureau is engaged in the preparation of the preliminary plans of the turret. It is the present rule to mount turret guns so that practically the maximum range of the gun can be obtained. For all practicable purposes, this means 40 degrees elevation, and the turret is designed on this basis. The turret design is first blocked out roughly in order to get an approximate idea of the best arrangement of mount, ammunition hoist, handling rooms, etc. It is essential that the dimensions of the turret, including the barbette, be made as small as possible, not only on account of the saving resulting in armor weights, but also on account of the reduction of target exposed to the enemy. The diameter of the barbette is governed by the distance from the center of rotation to the extreme position of the gun in recoil. This distance is therefore kept as small as practicable by moving the center of the trunnions as close as

possible to the turret front plate, by reducing the distance from the center of the trunnions to the breech of the gun to the minimum amount, and by limiting recoil of the gun. By moving the center of trunnions close to the front plate, we are also able to reduce the port opening through the front plate to the minimum size. The distance from the center of the trunnions to the breech of the gun is kept a minimum by increasing the weight of the gun yoke above what is actually needed to withstand the forces of recoil or to act as a counter-balance. It has been found from past experience that the trunnion pressure will not be excessive if the recoil of the gun is limited to about three calibers in length. With the position of the gun in the turret approximately determined, it is possible to fix the diameter of the barbette and the exterior dimensions of the turret armor. After the determination of these dimensions in the manner indicated, the elevating gear, rammer, powder and shell hoist machinery are laid out to go in the space provided. Arrangements are also made for the accommodation of personnel, fire control instruments, and range finders.

10. As the design is being laid down, computations are made to properly balance the various parts about the axis of rotation. All oscillating weights are balanced about the trunnions and, as far as practicable, the revolving weights are balanced about the vertical axis of the turret. After the upper portion of the turret has been sufficiently developed, consideration is given to the question of ammunition supply. The best methods for storing and handling the projectiles and powder charges are agreed upon, and machinery is developed to supply projectiles and powder to the gun at the maximum rate, at least three rounds per minute.

11. In the design of powder hoists, it is considered important that the supply of powder from the magazines to the guns be conducted with the least liability of danger to personnel and safety of the ship from explosions that may occur in various parts of the turret. To accomplish this, flame-proof doors are provided in all handling rooms, and the hoist is designed with interlocks, arranged in such a way that there is no direct communication between the turret chamber and magazines at any time. In order to localize the damage resulting from premature explosions and other causes, it is the practice to provide divisional

bulkheads between individual guns, and to enclose the turret officer and fire control group in a booth at the rear of the turret.

12. With preliminary plans available, the Bureau of Ordnance is prepared to supply the Bureau of Construction and Repair and the General Board, within a few days, with such information as is required to develop the preliminary plans of the vessel. In case information is requested regarding plans of a type of construction which has not been anticipated by the Bureau of Ordnance, the development work proceeds in a manner similar to that described above, but it is not possible in such a case to prepare plans in the same amount of detail. As an illustration of what may be accomplished in an emergency, the recent preliminary plans for the 6″ twin mounts for scout cruisers were prepared, and complete information regarding weights, cost, etc., *furnished within a period of three weeks.* This mount represented an entirely new departure in 6″ mounting, but owing to the close co-operation existing between the Bureaus of Construction and Repair and Ordnance it was possible to furnish complete information regarding the mount, and necessary modifications to the ship plans, so that a decision was reached by the General Board and recommendations made to the Secretary of the Navy regarding manufacture within the short period of time mentioned.

13. The Bureau of Ordnance has a series of standard ordnance allowances of ammunition, spare parts, tools, accessories, etc., and the caliber and type of guns having been once established, the use of these tables permits the Bureau of Ordnance to supply the Bureau of Construction and Repair with a table of estimated weights and centers of gravity for all ordnance material entering into the design. Tables are also furnished the Bureau of Construction and Repair, giving the working circles required for all guns, the trunnion pressures which the ship's structure must withstand for each type of gun, and blast diagrams showing effect of muzzle pressures at various distances. This gives all the data necessary to work up contract plans.

14. The General Board is provided with tables and formulas which give all the data necessary to determine penetration of armor, the data being sufficiently broad to cover any combination of caliber of gun and thickness of armor.

15. While the General Board is discussing the tentative

designs, representatives of the technical bureaus are called before it, and a general discussion of the various characteristics ensues in which armor is considered as well as other characteristics. The General Board then draws up tentative characteristics and sends them to the Bureau of Construction and Repair, where the various sketches necessary to show the general details of the design are worked up.

16. From these general sketches, which may cover a number of variations in design, the various weights of armor are computed by the Bureau of Construction and Repair, and then the drawings and weight data are turned over to the Bureau of Ordnance for detailed study. This study is based on general principles of protection only. If the records of the Proving Ground cover experiments which parallel the conditions laid down in the design, the bureau can determine with reasonable accuracy the protection which the various designs afford. If the ship possesses any unusual features, it is probable that no experimental data will exist covering parallel cases, and in this contingency it will probably be necessary to undertake a certain amount of experimental firing at the Proving Ground.

17. When the Bureau of Ordnance has completed its preliminary analysis of the design, or designs, a report is submitted to the General Board, through the navy department, which points out how closely the proposals meet the requirements, or points out where modifications or changes in the proposed designs may be made with benefit to the protection. Up to this stage the quantity of armor allotted to the ship or, in other words, the percentage of weight which can be devoted to armor protection, has been more or less approximate, and if the research of the Bureau of Ordnance shows any unusual conditions, it may be necessary that the allocation of armor be changed. For instance, it may be that a proposal will be made to change the arrangement or armor in such a way as to lighten the total quantity of armor required, or it may be that the research will show that the protection afforded is entirely inadequate and it may be necessary to request an addition to the allocation of weight for armor.

18. Upon these preliminary researches, the General Board generally bases the final general characteristics of the vessel, and

these final characteristics are again transmitted to the Bureau of Construction and Repair for the preparation of final plans.

19. These final plans are again referred to the technical bureaus, and the armor plans are then gone over with the idea of investigating them to determine with precision, not only the amount of protection afforded, but the details of construction, size of plates, connection between plates and bulkheads, etc. It is generally the custom of the Bureau of Ordnance to lay these plans before the manufacturers of armor, in order that the details of plate size, etc., may be agreed upon.

20. After this work had been concluded, and the General Board has given final approval to the plans, theBureau of Construction and Repair draws up contract plans, which are again referred to the technical bureaus. These contract plans are then transmitted to the armor manufacturers for detailed comment, and final fixing of joints, gauges, size of plates, etc.

21. In general, the cognizance of the Bureau of Construction and Repair and the Bureau of Ordnance in regard to the armor is as follows: the Bureau of Ordnance is, in general, responsible for the quality of armor and its manufacture in conformity with the contract plans.

22. The Bureau of Construction and Repair is, in general, responsible for the means of attaching the plates to the ship, connecting the plates to each other, etc. The two bureaus work together jointly in insuring that the plates are made as large as possible (to eliminate joints), and that they are secured to the ship and to each other with the greatest security possible, consistent with the capabilities of the armor manufacturers. Similarly, the Bureau of Ordnance is responsible for fixing the manufacturing tolerances and dimensions to meet the demands of the ship builders as expressed by the Bureau of Construction and Repair.

23. Prior to the advent of what may be styled modern construction, various arrangements and thicknesses of armor were tried, use being made of the obliquity of impact. Gradually design settled down to vertical belts, with few variations, the *Kahtadin* being the only ship which departed from this principle. From 1887 to 1903, armor was gradually increasing its ascendancy over the projectile. It was during this period that modern naval construction ideas were really developed. During this period the

torpedo had an insignificant range and the ram was frankly considered. Gradually, the power of guns was increased, the range of torpedoes was increased, and ram discarded and the generally accepted battle range was increased. After about 1903, however, the development of the projectile and the further increase in gun power gradually reduced the ascendancy of armor. This evolution has proceeded to the present day, but until about 1917, architecture never varied.

24. During the past few years there have been two distinct developments in naval architecture which affect armor: It is now conceded that torpedo risks may be incurred, and this development in opinion has been coincident with a very important and efficient development of anti-torpedo and anti-mine protection. Whether the change in opinion resulted from the development of under-water protection, or whether it was independent of it, is a question, but it is evident that in the present state of opinion and under-water protection, greater risks of torpedo damage will be taken. If this is correct, we are again forced to the conclusion that a material increase in the relative efficiency of our armor protection is mandatory. The other development in architecture is the inclination of the side armor outboard, which was first (recently) used on the British battle cruiser *Hood,* and later copied on our battle cruisers. These are the first instances of a departure from that system of architecture which had been followed so consistently for about twenty-five or thirty years. It is true that in our battle cruisers the inclination was used to bolster a markedly small plate thickness, and in the *Hood* it was used to cover a reduction in thickness of the belt to 11 inches from 13 inches in the *Queen Elizabeth.* However taken, it is a break in the long train of similar ships.

25. Before armor can be properly distributed, it is necessary to know:

(a) The chances of hitting various parts of the ship.
(b) The kind of projectiles the armor must resist.
(c) The effect of such projectiles on armor in various arrangements.

When considering armor, the thickness and quantity are, of course, limited by weight. Taking this limiting weight, we must properly balance the protection given various parts of the ship

working on the principle of "all or none," that is, vital parts should be fully protected, but very valuable weight should not be lost by the distribution of light armor around unimportant parts of the ship. At a very short range the side armor receives more hits, but at medium and long ranges more hits are recorded in the deck armor than in the side armor. At modern battle ranges only about 25 per cent, or less, of all hits will be received in the side armor and the target is essentially a horizontal one. Side armor must be thicker than deck armor, not because it is more likely to be hit or covers more vital parts—but because at short range when velocity is high it is subjected to more direct impact. Side armor may be hit at normal impact, but deck armor will probably be hit at an angle of more than 45 degrees from the normal. It would be useless to provide very heavy side armor and very thin deck armor, or very heavy deck armor and very thin side armor just below the water-line, where direct hits may be received.

26. In regard to attack by bombs from aircraft, there seems little to be feared in the way of penetration. A bomb simply dropped obtains a disappointingly small velocity even when dropped from so great a height as to make its aim uncertain. Even when dropped from extreme heights, bombs will reach a certain velocity at which the acceleration, due to gravity, is equaled by the retardation due to air resistance. This is called the "terminal velocity," and a study of it shows it to be small. To actually drop a bomb with the hope of its weight carrying it through the protective deck is practically impossible. It would take an altitude of about 10,000 feet to put an armor-piercing bomb through a 3½" deck.

27. The next question is that of armament; here we are, as always, limited by weight and space, and several factors must be considered. Our doctrine should be the maximum number of the lightest and handiest guns which will, at extreme fighting range, successfully penetrate the heaviest armor with which enemy craft will oppose them. The factors governing the decision as to the type of primary armament as regards its caliber are:

(a) Range
(b) Penetration
(c) Explosive effect

(d) Probability of hitting
(e) Rapidity of fire.

The total weight allowance will fix the number of guns and as between different calibers the factors which most influence decisions are (b) and (d), as the differences between the others are small. The Naval Treaty on Limitation of Armaments has fixed the caliber at 16″, and it thus becomes a race between designers as to who can turn out the most powerful gun of the lightest weight, the two variables being muzzle velocity and weight of projectile.

28. The most advantageous composition of battery as regards the caliber for the primary armament having been determined, it remains to decide upon the arrangement of battery in order to obtain the greatest arc of fire, or maximum fire efficiency, from each gun. The American practice *has been standardized,* and it is believed that the four 3-gun turret arrangement of the *Pennsylvania* presents the best solution of the problem.

29. To sum up, the general conditions governing the primary armament of the modern capital ship are as follows:

1. The greatest weight that can be allowed for the armament.
2. The number of guns required.
3. Their disposition within each turret (twin, triple or quadruple).
4. Disposition of turrets (superposed, echelon, etc., as affecting the weight of armor carried).
5. The weight of the projectile and powder charge as affecting the number of rounds of ammunition to be carried per gun.

30. It is evident that for similar types of guns and turrets, the larger the caliber of the gun, the larger the turret, and the greater the ammunition weights, and, although modern design has done something to reduce the ratio, it is still very large.

31. The main battery does not fulfill all the necessary functions required of the complete ship's battery, and it is necessary to place on board ship additional weapons which are in the nature of a protective armament to fulfill special requirements. The primary mission of a battleship has already been cared for by the

installation of the heavy armament which is given priority throughout. Therefore, when we come to this secondary armament we find that the greater part of the allowable weight has been used up and that the best spaces and locations for guns have also been assigned. Consequently, the secondary armament is limited to the smallest calibers, the lightest weights, and the smallest number of units that can be expected to do the required work acceptably. The arrangements for these secondary batteries are influenced all the way through by the priority given the main battery, by the necessity for limiting the size and number of guns, and by the necessity of avoiding blast interferences. Ships are crowded more and more by the demands for a heavier main battery, more armor protection, and more speed and greater steaming radius. It is believed that for future construction the secondary battery will probably be mounted in blast-proof enclosed mounts closely resembling a small turret. This appears to be the best compromise solution that can be obtained. Anti-aircraft guns —at least eight—will be on the upper deck so located as to give the best possible arcs of fire, and will also be used as star-shell battery.

32. In developing the detailed plans, the following points require constant and close co-operation between the Bureau of Ordnance and the Bureau of Construction and Repair:

Ammunition stowage and handling arrangements—safety features.

Torpedo stowage and handling arrangements.

Arrangement of tops and conning towers for most efficient locations for fire control instruments (clear vision, etc.).

Arrangements for mine stowage and mine tracks.

Ammunition hoists and torpedo tubes on submarines.

Also co-operation with the Bureau of Engineering regarding:

Wiring and arrangement of instruments for plotting rooms, torpedo tracking rooms, and all fire control and torpedo control stations. Generally, all voice tube and telephone leads and outlets.

33. It is desired to point out, in connection with this discussion, the very close relation between technical ordnance and gunnery ideas and ship construction ideas, as regards design of ships. Even such a matter as the construction of the enemy's fuses has a tremendous effect. We do not fire at ships merely to pene-

trate side armor or to disable personnel, but to accomplish their destruction. The protective deck is at present the most interesting target, and we cannot build our protective decks without a clear idea of what the enemy's fuse is capable of. It is believed that it has not generally been appreciated how necessary it is for the three material bureaus (ordnance, engineering, and construction and repair) to co-operate with each other in ship design.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ADDRESS DELIVERED BY CAPTAIN McNAMEE ON APRIL 4 TO NATIONAL COUNCIL FOR REDUCTION OF ARMAMENTS

Mr. Secretary, Officers of the Council, Ladies and Gentlemen:

I thank you for your great kindness in permitting a navy man to occupy a few minutes of your valuable time in presenting for your consideration my views on the subject of the navy and the 5-5-3 ratio. The views that I express are my personal ones and carry with them no departmental authority or responsibility. I am a reader of your *Bulletin of the National Council for the Reduction of Armaments* and I assure you I find it filled with sentiments of the very highest and noblest altruism. I will go further and say that its arguments are so cleverly and logically prepared as to make the most dyed-in-the-wool militarist pinch himself in order to wake up before he is converted.

I am not a militarist—I am down on militarists from the Kaiser to the last Hans or Fritz.

We, of the regular army and navy, love peace and hate war, because we, above all, know what it means.

In my long experience in the navy I have had occasion to note that when international friction arises through some unfortunate incident the most belligerent expressions in the public prints are not from the army and navy, but usually from those who are opposed to efficient armies and navies and frequently the most rabid of all come from the pulpit.

We have just ratified a treaty by which we have made the greatest sacrifice and the greatest renunciation ever made by a nation in the cause of peace—we have agreed to scrap twenty-eight battleships, thirteen of which, now building, were to be the most powerful engines of war ever conceived by the mind of

man. We scrap property of a value estimated at over a third of a billion dollars. We renounce for a generation to come the power to be the reigning mistress of the seven seas. We, of the navy, approve of the sacrifice and of the renunciation. Competitive building against friendly nations with whom we desire only friendship and goodwill is unnecessary, extravagant and ill-timed, when in its place we can substitute an agreement whereby our present porportion of relative strength may be maintained. It is no secret that the naval treaty would not have been practicable without the whole-hearted co-operation of the navy, which assisted in devising a technical plan that made possible the undertaking of our great secretary of state.

The plan that proved so successful was based on a fixed ratio of strength in capital ships, giving equality to Great Britain and the United States and three-fifths of such strength to Japan. This is known as the 5-5-3 ratio. If you had seen and understood the time and care that was devoted by the representatives of all the powers to the exact tonnage and exact ships by name that went to make up this ratio you would perhaps be less prone to treat it so lightly and proceed to toss it aside as a paper triviality. The ratio expressed was the minimum proportion that each nation should have in regard to the others in order that the national safety might be assured. Our delegates cut to the bone and went to the very limit in generosity. The sacrifices of the other great powers were less than ours. Great Britain had no new ships to scrap.

Nothing was said as to the number of personnel in the several navies, it being assumed that this was adequately limited by the number of ships. But it must not be forgotten that men fight and not ships. That historically good men in poor ships have invariably triumphed over poor men in good ships and that ships themselves are but inert masses of steel and machinery that are helpless in war unless manned by trained officers and men. These officers and men can be trained only in time of peace. When war comes it is too late. It is a life work for an officer and years for a man, and unless ships are assembled in fleets and we learn how to co-ordinate aircraft, surface craft, and submarines for battle we will be ignorant of our profession and bring humiliation, dishonor, and disaster upon our country in time of need. A modern navy

is not something that one can take out of one's pocket when war breaks out and then toss merrily on the scrap heap when the war is over. Navies are the first line of defense and must be ready for instant use since history shows that naval attacks may precede a declaration of war and go far toward deciding its issue. Great Britain proposes to reduce the total *enlisted* strength of the Empire to 104,000 by April, 1923, a year from now. Her crews are old and seasoned with twelve-year enlistments. Ours are boys with an average age of about twenty years, with two-to four-year enlistments. In addition we have to man our tankers, repair and hospital ships with regular sailors, using up a valuable part of the regular force, while Great Britain now mans these ships entirely with reserves and merchant sailors that are not counted in her enlisted strength. Japan proposes to reduce her enlisted strength to 68,000, although she is allowed only three-fifths of our strength. This would give her 1,000 more men than you would give us. In other words, you are trying to scrap the principle of limitation by agreement and substitute in its place a principle for which no responsible statesman has ever stood, the principle of limitation of armaments by example.

It is very easy to give advice and to urge the adoption of beautiful dreams, knowing that those who are charged by their fellow citizens with the responsibility for the safety and defense of this country will not adopt your recommendations unless they are safe. But you, ladies and gentlemen, are responsible and influential citizens and voters and should not shirk your responsibility in this way. Until you have studied both sides of this question and have asked yourself why it is that no responsible statesman is advocating disarmament or limitation of armaments by example I beg of you not to sign petitions advocating a policy which you, in office, would not dare to carry into effect. Not one of you sitting here, were you in authority, would dare to disarm this country, or to ruthlessly reduce armaments, as a hopeful experiment.

I beg of you all before you go further in this matter not to take my word for it, but get from the government printing office "The Naval Policy of the United States" as announced by our Presidents in state papers from George Washington down to present times. You will find that every single President has

found it necessary to urge upon Congress the absolute necessity of a strong and efficient navy. Does this mean nothing to you?

Congress must represent the people. It must give what it thinks the people demand. Be careful what you demand—you may get it.

This government, like all governments, is largely controlled by active minorities. An extreme case is seen in Russia where a handful of vigorous propagandists control the masses of ignorant millions. The peace organizations of this country are in a position to do tremendous good or tremendous harm. Each of you is responsible for the demands you are making.

I read in your *Bulletin* that if we set the example other nations will disarm—I look in vain for any example that would warrant such an assumption.

We have reduced our army to a point where it is a mere fraction of the armies of the great powers. Have they followed our example? France has over 600,000 men; Great Britain, 562,800; Italy, 300,000; Japan, 300,000; Belgium, 120,000; Czecho-Slovakia, 215,000, and even Roumania with 190,000 will have 90,000 more men than you now propose to give the entire United States with its dependencies.

Does anyone imagine that if France disarmed in 1913 Germany would have followed her example? I will not labor the point further. No responsible statesman could ever propose such an experiment. The only principle that has ever scrapped a gun is the principle of limitation by international agreement. If you stand for further limitations by international agreement I am with you. But if you wish to limit by example I call your attention to the condition of China, which stands as the world's great shining illustration of the results of limitation of armaments by example—a perfect example of the effects of pacifism and non-resistance. The profession of a soldier there for ages has been looked upon as lower than that of a coolie. But experience is bearing some fruit and China is waking up. We can hope that the time is not far distant when she will stand on her own feet without assistance from anyone. When that day comes I think there will be some difficulty in persuading China to attempt another adventure in helplessness. There is some food for thought in the fact that the most peaceful country in the world is Switzer-

land although every man there is taught the profession of a soldier.

The point of departure between the views of responsible statesmen and of those who would advocate disarmament lies in their different conception of the actualities. The statesman must deal with the world as it is, while those with the vision of idealism deal with the world as it should be. These two points of view account for the great confusion of thought that now exists in the world and has its analogy in the medical profession, where a reputable physician deals with the disease, while his quack rival ministers only to symptoms. The great American public is prone to approach every great trouble from the point of view of its symptoms. If the weather is bad and the crops fail the political party in power is held responsible for the failure. If there has been a great war and taxes are heavy the blame falls on the party that must levy the taxes.

We may wonder why a nation that a few years ago was calling enthusiastically for the largest navy in the world should appear today to be calling for complete disarmament. The cause is not far to seek. History shows that it is the psychological sequel of all great wars. The world wakes up from an orgy of war, raises up its right hand and says, "Never Again!" I trust this time with more sincerity than many a good citizen (before the eighteenth amendment) awoke in the morning and gave voice to a similar sentiment.

I wish to emphasize the point that in talking disarmament we are talking of a symptom and not of a disease. Great armies, great navies, and great guns are not what ails the world. They are symptoms that will endure until the disease is cured—that disease is international injustice and oppression.

The basic causes of war lie in congested population in one country and under-population in another, the struggle for the world's raw materials, the exploitation of weak nations, low international morality based on motives of fear and interest, and racial hatreds.

I cannot believe that we are no better than charlatans with quack remedies, treating symptoms as they arise, and that we lack the moral courage to strike at the root of the disease itself. Burglaries are not committed because burglars have the tools. The

tools exist because there are burglars. When the burglar reforms his tools will be found upon the scrap heap, but no burglar was ever reformed by taking away any or all of his tools.

In all its history our navy has never caused a war, nor tempted any of our citizens to go to war. In our country Congress, backed by public opinion, makes war. Armies and navies make peace.

To those who still harbor the belief that the navy is a millstone around the necks of the people without cause or excuse in time of peace, I wish to point out just a few facts of which our citizens are in astonishing ignorance.

The people of our country spend annually for all purposes about $50,000,000,000. Taking $400,000,000 as a proper expenditure to maintain our navy, and which is twice what your *Bulletin* would give us, it means that for every dollar we spend on a navy we spend $125 for other purposes. The figures for 1921 indicate that we spend nearly a billion dollars a year for soda water and confections. Enough is spent on chewing gum alone to support the navy. It is claimed that we spend much for navies and little for education. It is no function of the federal government to maintain schools, but there is spent for education annually by the people of our country more than one billion dollars. The federal government is the only agency charged with the duty of providing for the common defense, it is one of its principal duties and it is not surprising that about ten per cent of the federal budget should go to the navy.

Compared with rates before, the taxes are indeed burdensome, but they are not spent on the navy. If you paid an income tax of $100 this year the scrapping of our capital ships will enable you to deduct on that account just forty cents next year. Your income tax will be $99.60. New York City alone pays an annual tax of $613,000,000 and has a debt of over a billion dollars. A holiday in building battleships will reduce taxes in New York City from $100 to $99.38.

As the bulk of federal revenue is now raised by income taxes, the farmer and the laborer scarcely feel it.

We need economy and no effort should be spared to enforce economies in government expenditures, but I can assure you that the navy has gone the limit in this respect. Our whole fleet

is now practically immobilized to save fuel. However, a country that is rich enough to hand out a gratuity of three to five billion dollars in a soldiers' bonus can hardly begrudge the few millions that mark the difference between the minimum to preserve efficiency, that is, 96,000 men asked for by our secretary, and what your *Bulletin* is now advocating.

Whatever conception foreign powers may have of the mission of armaments we know and they know that the American idea of the business of armed force is to maintain law and order, to prevent tyranny and injustice, to protect the helpless, the half-civilized and the savage. Our conception of the function of force is to give moral ideas time to take root, but that force should be sufficient to insure that a breach of the peace should not promise desirable results to anyone. We cannot do this without maintaining the navy that the treaty gives us.

We stand today charged with a heavy responsibility. We are one of the great custodians of civilization. If we are shorn of our strength by the opiate of foolish optimism the power for good will pass to others with more selfish motives.

We American people are the most idealistic, altruistic and optimistic in the world. Not because we are inherently better than anyone else, but because we have our ambitions satisfied. Wanting nothing ourselves we sincerely seek the good of others. Shall we sacrifice those who look to us for light and protection? Sea power and civilization have gone hand in hand since the dawn of history. The sea power of Holland, France, Portugal, Spain and Great Britain have carried Christian civilization around the world. Today the American navy controls and operates our world radio communication, it furnishes the charts of our mariners. It controls and operates the radio compasses that guide our great commercial fleets into our ports in storm and fog. It is guiding, instructing and protecting the natives of Haiti, San Domingo, and the Virgin Islands, where it has stamped out revolution and reduced the death rate to a figure equal to the best we can show in our home country. It has increased our trade in the Near East through the protection of our destroyers by over 1,000 per cent. It has earned the highest commendation of Mr. Hoover by its spontaneous effort in all European relief work. It is protecting our missionaries and our trade in the far reaches

of the Yangtze-Kiang. It is our standing guarantee of the integrity of the western hemisphere against the aggression of any foreign power. Never in its history has our navy meant aggression or injustice to anyone. It has stood ever as the benevolent strong right arm of the government extended only to sustain and protect.

If we expect a great merchant marine to carry our surplus products over the seas we must have an adequate navy to protect it. The two go hand in hand, as every nation has found by costly experience. Political economists tell us that war is but the ultimate form of economic competition. If we are to compete in the world's markets let us see that our weakness does not tempt our competitors to paralyze our foreign trade.

We have seen the tremendous asset our sea power was in the negotiations of the conference. Having a great navy we were in a position on which to trade. It was not so difficult to induce the great powers to reduce their navies when the alternative meant the continued superiority of our fleet. With an inferior navy what inducements can we offer at the next conference? Beautiful as were the reasons of humanity, altruism, and idealism advanced by our people in favor of limitation of arms, they could have been as ably presented by any minor power that possessed not even a solitary gunboat. Whether we like it or not the fact remains that when nations assemble around the council table the one with the greatest background of armed strength still receives the most attentive hearing.

We entered the World War to make a war to end war. That struggle ended in victory, leaving us the richest and most influential nation in the world. We desire now to make the holy purpose of that war a living truth. We ask none of the spoils of war. We crave only the privilege of co-operating with enlightened and free nations for the good of mankind. We long to remove the causes of friction that incite wars. Let us not lose the influence of our strength in the councils of the world till this noble purpose has been accomplished.

Having stated that arms are a symptom and not a disease I am going to make bold to suggest a remedy for the disease itself. I make no claim to originality.

It is a remedy which, in my opinion, is practicable. It is one in which honest men of every race can find nothing but good. I commend it to your earnest attention. Its object is to substitute a reign of law for a reign of force. Let us assume that a reign of law rests on three elements, a law, a court, and a sheriff.

Let us assemble the civilized nations of the world and codify international law. A code that will prescribe the rights and duties of nations in all their relations. Let us all sign a treaty adopting this code. Let us establish an international court to interpret these laws and hand down final decisions. Let us sign a treaty agreeing to be bound by these decisions.

Next let us not wait for a thousand years till the world is ready to accept an international sheriff but let us all sign a treaty agreeing to treat as an outlaw any nation that refuses to be bound by the decisions of the court.

This appears to be an entirely logical procedure. The injured nation then would have the same rights as a sheriff in the enforcement of the decree, while the nation in contempt of court would have only the rights of the outlaw or the bandit. While armed force would still be necessary it would be force used only in the enforcement of the law.

Here is something tangible and practical but it requires courage to boldly attack the disease itself when it is so simple to palliate symptoms even if thereby we aggravate the real malady. Limitation of armaments can only be a palliative justified principally on grounds of economy. Disarmament of the world at this time would mean universal chaos. I would have you, ladies and gentlemen, turn the great power of your organizations to the real constructive measures that a war-weary world has awaited so long in vain, a practical method of substituting a reign of law for a reign of force.

In closing, I do not wish to give the impression that I am a pessimist. I have faith in Congress and in the American people. I know that they believe in our navy, they realize it is their first line of defense—that with their great wealth the support of the navy is an insignificant burden upon them. They realize that the American navy has never caused a war, but that it is in constant use to prevent war and to protect the oppressed.

I cannot do better than to quote our beloved Secretary of the Navy in his recent message to the American people:

"The American people want a razor-edge navy ready for battle at any time, not the largest in the world, but second to no others. If we are to sit at the first table in the councils of the nations we must have such a navy. The Conference on Limitation of Armaments provided for such a navy. Why not insist that we have it?

"Whatever armed forces have cost us they have made and kept us a nation. When we can live without fire, police, and health protection, it will be time to discuss giving up the navy. When we can dispense with insurance we can dispense with the navy.

"The United States and the world need the American navy. Let's keep it a good navy."

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

MORALE AS IT AFFECTS THE LEADERSHIP OF A DECK OR ENGINEER DIVISION

By Lieutenant Ernest G. Small, U. S. N.

The signs of the times point to a more intensive cultivation of personnel in the naval service. From immediately after the Spanish war until the present, the development and increase of material has far out-stripped the personnel furnished to operate it, with the result that more directing energy has gone into the preservation of material than should have been necessary. With the decrease in the number of capital ships and other limitations, one may hope that the training and leadership of personnel will receive more intensive study than it has heretofore.

Before the word morale is relegated to that limbo of over-worked words along with efficiency and psychology, and consequently before it has lost its savor, I should like to express some ideas as to how morale affects the leadership of a deck or engineer division on shipboard. If the word morale conjures up the vision of a highly centralized departmental bureau or division having its outward manifestations in morale officers, boxing bouts, chaplains and Red Cross workers; a sort of machine that produces neatly tagged packages of morale, I have nothing to offer. It is typical of human nature, and we of the naval profession are no exception, to want to get something for nothing. Morale is not attained in this manner, but rather results from intelligent and laborious work. I shall attempt in this paper to map the problem of the division officer in building up morale, and suggest some methods of achieving it. I have nothing new to offer, I am merely re-starting age-old facts.

What is this morale of which one hears so much? All the authorities agree in striking unanimity. "Moral or mental con-

dition as regards courage, zeal, hope, confidence, and the like; used especially of a body of men engaged in a hazardous enterprise as soldiers or sailors in the time of war"—so states the *Century Dictionary* and the *Webster* and the *Oxford* definitions are practically identical. Language is such a living, growing thing that words push beyond the meanings hedged about them by academicians. Morale has come to mean more than is here stated. It must exist in peace as in war. It is the unceasing will to achieve in a body of men under all circumstances expressed as if it emanated from a single resolute soul. It suggests voluntary co-operation, an ability to give a little here and there but always to advance, and above all it suggests intelligence. There is nothing passive about it, no posturing with "head bloody but unbowed," but rather the wresting of the club from the hands of adverse circumstances. The problem then before a division officer may be recast in engineering terms as follows: "To design and build a moral or mental condition in a group of men with sufficient factor of safety that this condition remains intact under all possible stresses of peace and war suffered by individuals of the group, short of death itself."

The literature of morale is prolix in negative principles; but it is not very rich in a positive way. I mean by this that we are told almost to the point of wearisomeness that if we do certain things or allow certain conditions to exist, or fail to do certain things we will destroy morale; but we are not told that a healthy morale will positively flow from following concrete directions. I suppose this is true because we are dealing with the minds of men, more particuarly with their emotions; because at best our position is similar to one cultivating a garden: he can plant and tend, but he must count on the soil, water, light, and heat to do the major share. There are certain fundamental negative conditions that affect the morale of a ship's division which I purpose to discuss in the order of their importance. In this discussion I shall attempt to point out the division officer's responsibilities for an equitable adjustment of these conditions. These factors are money, food, shelter, working conditions, clothing, and leave and liberty.

MONEY

Let us consider money. I was much struck once on hearing a gentleman begin an address before a college Y. M. C. A. on the choice of a profession by stating that the first consideration should be the rewards that the profession has to offer. Such apparent cold-bloodedness amazed me in a meeting of that sort. The speaker went on to state that no matter how altruistic a man might be his influence in a community was nil unless he adequately provided for his family. Whether we consider it from an ethical side or not, money is a powerful factor in men's lives. This is especially true in the United States, where money has been eagerly seized as a convenient gauge of a man's success. With Congress fixing the rates of bluejackets' pay, and a supply officer disbursing it to the men, there seems little that the line officer has to do with money; but this is a superficial view. In the first place, he can always throw the weight of his influence for adequate remuneration, for he must realize that it is a powerful incentive to men. Second, he should be fairly familiar with the pay tables so that he can advise his men in any question of payment, without bothering the usually overworked pay force. This has a surprisingly good effect in letting his men feel that he knows something about what concerns them vitally. Third, he should be always on the alert to insure prompt payment. This may take the simple form of seeing that the division is assembled promptly for pay, and that provision is made for obtaining the pay of men engaged in duties elsewhere. If it be true that time is an important factor in decisions, it is also true that time is a factor in the payment of money to men. The average man, broke on pay day, does not enjoy waiting a day later for his pay because he happens to be loading provisions on a dock at the pay hour. To those who served on small vessels in the war, carrying no pay officers, it is needless for me to recall the great hardships suffered by men and their families due to delayed payment of money, and its lowering of morale. The memorandum pay roll seemed the best solution. In this connection let me observe that a supply officer is but human. The thrusting of a memorandum roll on him, and the payment of a hundred men from another ship, bringing more work to his possibly scanty force, he does not enjoy. The navy regulations require that a letter be

addressed by the commanding officer of the ship carrying the memorandum roll to the senior officer present afloat requesting that a supply officer be designated to pay the ship. To you executives of small craft, I suggest you follow this method to the letter, and you will never place yourself in the humiliating position of begging money for your men, nor will you be informed that it is being done as a personal favor to you. Fourth, having a knowledge of pay tables, a division officer giving due consideration to the interests of the government may often be able to obtain extra compensation for a good man, and may use his knowledge to clean out a nest of sinecure holders.

Closely allied to the question of money, is that of promotion. Owing to frequent changes in the complements of ships, the tendency has been noticed of men to assume that promotion is something that can be demanded, and not earned. This idea should be ruthlessly crushed. On the other hand, the crushing of this idea requires that the division officer make every effort possible to promote a worthy man before he nurses a grievance. No man should ever have to ask for promotion. A state of affairs should exist such that every man knows that he will be promoted if a vacancy exists and if he is worthy, and if he is not promoted, it is because of a failure of one or both of these conditions to be fulfilled in his case.

FOOD

The matter of food is particularly in the province of the supply officer. On most ships there are four persons who are keenly alive to its importance: the captain, the executive officer, the supply officer, and the commissary steward. I do not mention the men themselves. All of us know that certain ships have reputations as good feeders, and that certain commissary stewards are looked to with the veneration that is usually only accorded to professional baseball stars. The division officer's part is to occasionally, not too often, walk through his part of the mess deck, preferably at breakfast or supper. With an ear to the ground, slight observation, and some tact, it is possible to smooth matters in the way of food to a considerable degree. A great deal depends on the manner in which these observations are made. No high and

mighty attitude will do, nor will the other extreme be effective, for it is human to complain needlessly. The officer must strike a happy medium of sympathy and justice. A little humor goes a long way here. The old custom of removing the cap while inspecting conditions should be followed.

SHELTER AND WORKING CONDITIONS

Someone has pointed out that bluejackets spend their time either lying down or standing. That, to most of us, delightful intermediary position of sitting with feet on a lower level, is in a large measure denied them. The installation of a reading room for the crew has helped matters somewhat, but at best conditions in this respect are bound to be poor. A battleship may be likened to a town of fifteen hundred people. No one likes to go to the town library for the sake of a seat. Without increasing the fire hazard and without messing things generally, it is possible to encourage the placing of chairs somewhere in the division's part of the ship. This is worth study.

Conditions being what they are, a great deal of thought and effort must be put into the planning of berthing space. The first lieutenant cannot adequately look after the berthing comfort of every man. He can block out space to divisions and indicate in a somewhat broad way their limitations. The division officer can and should see that every man in his division has ample swinging space, and a supply of fresh air. I shall never forget when on a midshipmen's practice cruise I was expected to swing a hammock in a space eight inches wide. Such a problem was too much even for the executive officer. However, he told me that I had to swing there. Of course I did not. I wandered off elsewhere, to a place where I had no business going. A problem involving a group of individuals must be solved by one person capable of estimating it in all its aspects. If he fails, or neglects to solve it, the individuals concerned solve it with consequent chaos.

Bearing a close relationship to shelter is the guarantee that every man's personal property be immune from the depredations of others. I am quite aware that this is a subject that one ordinarily does not discuss in a paper of this kind. Theft is not a product of high morale. On the contrary it will kill morale

as quickly as any agency known. Should an epidemic of this sort break out whether by means of a draft of men newly arrived on board or otherwise, an intelligently planned campaign should be carried out to catch the culprits; and certain and sharp punishment should be meted out to them by the captain. The co-operation of the entire ship's company must not only be enlisted, but drafted if necessary. The most effective method is by increasing the number of the ship's police. I believe that the expectation that the men will form volunteer police on their own initiative or through encouragement is not only unfair to them, but thoroughly unsound in that it presupposes a co-operative form of democracy in a government that in theory and practice should be a benevolent autocracy. The part of the division officer in the event of this contingency is to state the case to the executive officer, and to bring all the influence he can muster on the side of increased protection for his men. He should also hold frequent bag inspections, and report all cases of men having the clothing of others in their possession. He should never forget that theft is one of morale's greatest enemies, and that as long as it exists in the ship, all his other efforts in morale building are nullified.

Every man is entitled to decent working conditions. Generally speaking working conditions are decent in the naval service. Preventable hardship has no part in a morale-building program. The hardships of going to sea have been materially lightened, but there are still enough to toughen the physical and mental fibre. Working men in wet clothing or feeding them at odd times when either evil may be avoided by judicious planning indicates poor management. When hardships have been reduced to the unpreventable minimum it is time to drive if need be, and drive hard. The division officer should be keenly alive to the possibilities of improving working conditions.

I can best illustrate the point just made by describing an occurrence in one of our late superdreadnaughts. The men operating the evaporators there, on live steam double effect, worked in a moist atmosphere in which the temperature averaged 130° F. in a temperate climate. Needless to say their efforts were listless and the physical condition of the plant wretched. An attempt to operate on auxiliary exhaust steam failed because this method could not produce enough water for normal consumption.

Investigation showed that the inlet auxiliary exhaust line was too small. In spite of almost insuperable difficulties the engineer officer obtained permission to make the necessary changes in piping, and carried out the alteration between times in port. This change resulted in producing enough water by this method, and brought down the working temperature to 95°-100° F. From being an eyesore, the evaporator room became somewhat of a show place. The increase in the morale of the evaporator gang could not be measured.

Clothing

Manners maketh men, but clothing has a share in the process. If this statement is hard to believe look on the thousands of men who persist in staying in the lowest ranks of the clean collar class with no hope of advancement, rather than cross the divide into the mechanic's class with its increased monetary rewards, but loss of the badge of class. But I have no desire to present the philosophy of clothes. Carlyle has done it much better. I do wish to bring out that neat, suitable, and abundant clothing stiffens a man's backbone. In the naval uniform we have something that answers these specifications in the main. The difficulty that clothing presents in the navy is one of administration chiefly. Consider the problem from the point of view of the man. He is told that he must wear regulation clothing. To get it, he frequently has to stand in a long queue, occasioned by inadequate service in the ship's store. When he gets it, it is regulation clothing but likely enough it will not fit him. He does not know that the ship's tailor is required to alter it without charge to him, and if he does know it, he finds the latter very much overworked, or very prone to be absorbed in a more lucrative job. On the other hand, he sees a shore tailor close by the boat landing whose shop he can enter at any time, leisurely smoke a cigarette, choose his clothing, and if the desire strike him, indulge in a few vagaries of uniform not regulation, a desire which, by the way, comes to all of us compelled to wear a uniform.

From a consideration of the reaction of the clothing problem on the man it must be patent that the division officer should investigate the conditions surrounding the issue of clothing. He can frequently get poor conditions remedied by the exercise of tact via the supply officer or the executive officer. Failing in

this, he can oftentimes arrange his division work so that the division can go to the ship's store as a body, at a time when it is not open to the general public. As for the so-called vagaries, such as narrow jumper collars, I have never seen any virtue in a broad collar except for the disciplinary value of conformation. Like many of the newer art forms, one must be educated up to it. However, it having been settled long ago that the broad collar is regulation, the division officer must preach it in season and out. He must do more. He must see that virtue is made reasonably easy. The worst thing he can do is to wait until the day before an admiral's inspection and then scream at his division because they are not all in regulation uniform.

LIBERTY AND LEAVE

The fact that naval life is unnatural cannot be ignored. If this were not so the comparison of Dr. Samuel Johnson relative to seafaring and going to jail would not have survived as long as it has. Morale demands that men get out of the naval atmosphere frequently. Curtailment of liberty engenders resentment, and should not be practiced except when urgent necessity requires it, and as a punishment. Either case is one for the captain. On the other hand, liberty within reason works powerfully for contentment. It is something that does not administer itself. The administration of liberty is not standardized through the fleets beyond the broad requirement of the naval regulations that fifty per cent of the crew be kept aboard to guard the safety of the ship. It is usual for the executive officer through his office assistants to regulate the liberty, using one of many systems of control. The division officer should be thoroughly familiar with the system in vogue. He should frequently examine its workings, and on discovering any irregularities quickly make representations to the executive officer on the subject. He should study the system critically and if he has any constructive criticism to offer he should make it tactfully to the same authority. Any extra personal effort he makes to get his men off the ship promptly at the liberty hour will be richly repaid in increased loyalty.

I can best illustrate the general statements just made by relating some circumstances that came under my observation as senior assistant engineer officer on a fleet flagship. The flotilla

of boats carried on that ship consisted of five motor sailing launches, and six motor gigs. The operation of these boats from the engineering side gave considerable difficulty. They were continually breaking down. Investigation showed that while some of the difficulty could be charged to failure to obtain spare parts for replacement purposes, the major share of the trouble was due to personnel. The boats were supplied with double crews from the deck force, but owing to a shortage of engine operators, the latter were supplied in the ratio of 1.5 men per boat. This meant that the engineers got ashore only every fourth day, unless the man's particular boat was in the skids for overhaul, when he got every other day liberty. The average bluejacket is no fool. He saw to it that his boat broke down when he wanted the liberty rate speeded up. On the discovery of this state of affairs, double crews were assigned to the boats, and regular liberty granted. The proviso was made and enforced, that if a boat went into the skids other than for a periodic overhaul, it was to be considered an emergency that required the retaining of both crews aboard until the repair was complete. The effect of this change was marked. It illustrates two well-established principles: namely, that frequently material troubles can be directly traced to faulty management of personnel, and that the way of the law abider should be made easy, and the way of the transgressor hard.

Leave is closely related to liberty. It is, however, something more than lengthened liberty. It gives a man a chance to get away for a time from the irksomeness of naval discipline without the ever-present worry of catching a boat to get back to the ship on time, or at least with the latter possibility relegated to a somewhat nebulous future. Every man needs leave if the service is to get from him the best he has to give. The matter of leave is something that the division officer has not a great deal to do with. I wish to point out in this connection some factors that seem to have escaped attention. The modern battleship is a highly organized community of fifteen hundred or more workers. Some of these, the deck force, engage in seasonal occupations, that is, they work at high pressure at certain times such as at target practice and during a coaling, and at other times their activities are fewer. During the time first mentioned

their services cannot be spared, and at other times they can be. There are other men whose work is not seasonal but day-in-and-day-out steady production. I refer particularly to the evaporator, ice machine, and machine shop gangs. There is never one time when their services can be spared more than at any other. Moreover, it frequently happens that when the deck people get leave, their services are in greater demand, if that were possible, that is, during a navy yard overhaul. On many ships leave is regulated as if all men were seasonal workers, and no provision made for the steady worker. Leave is given by the number as it were. The ship in theory is supposed to cease to function at Christmas and all hands go on leave. This, of course, is never done in practice. The men I have mentioned are required to stay aboard with the result that they rarely get their proper share of leave. Wherein lies the virtue of keeping an ice machine operator aboard during every target practice? Meat spoils just as quickly while the ship is at anchor in a leave port. I grant that a man-of-war exists only because of her armament, that every man on board must contribute in some manner toward making that armament effective, but I cannot see any lessening of the effectiveness of the armament if the special class of men I have mentioned miss an occasional target practice, especially as target practice is almost a continuous performance throughout the year. The whole difficulty appears to me to be the inherent one of trying to make a sweeping, general plan work without considering exceptions.

The specific part of the division officer in the granting of leave is simple. He forwards the man's request to the executive officer approved or disapproved. He should never question illness in the man's family. Better let a dozen "slip it over" than hold up a real case. Higher authority will probably detect the faking. Much depends on the manner of approving a request. Well-earned leave may be approved in a willing manner, or it may be forwarded grudgingly. The latter method never makes for loyalty.

To recapitulate, there are certain basic factors that must be properly adjusted or the whole structure of morale is weakened. These factors are money, food, shelter, working conditions, clothing, and leave and liberty. I have chosen to call these factors

negative principles because the effect of their improper adjustment is destructive; yet at the same time proper adjustment of them will not insure high morale, but will prevent an abnormally low morale.

By its very definition morale is an essentially mental if not spiritual quality. So far the factors mentioned have been for the most part purely physical. They may be compared to the sound physical body required to house an active, healthy mind. Their value lies in the fact that an observance of these principles will build confidence in the leaders on the part of the lead, an absolute essential to morale, and without which the military ideal of a benevolent autocracy ceases to be benevolent and becomes merely autocratic. The morale builder must go further and carry out certain positive, more intangible principles to make his structure complete. These principles, necessarily more elusive than the physical are not as capable of as precise definition or treatment. They are: fitting the man to the job, explaining the man's relation to the whole organization, the why of orders, truth in intercourse, courage, tenacity and zeal, and the part of the officer. I shall endeavor to point out their bearing on the division officer's problems.

FITTING THE MAN TO THE JOB

The human raw material coming to any ship's division is varied. It is, however, almost universally young and possessed of a common characteristic, restlessness. The first essential is to get the round pegs into round holes, and the square pegs into square holes. This can be done best by the officer making himself thoroughly familiar with each man, watching him closely under varying circumstances, and recording his characteristics in a simple card index, one card to the man, wherein is recorded all his official history and as much of his unofficial history as can be obtained, together with a summary of his salient characteristics. The late William James in an illuminating piece of self-analysis wrote in a letter to his mother;[1] "I have often thought that the best way to define a man's character would be to seek out the particular mental and moral attitude in which, when it came upon

[1] *The Letters of William James,* Edited by his son, Henry James. The Atlantic Monthly Press, 1920, Vol. I, page 199.

him, he felt himself most deeply and intensely active and alive. At such moments there is a voice inside which speaks and says, 'This is the real me!'" It is a most important task of the division officer, perhaps one of his most important duties, to find in each man what causes that man to be "most deeply and intensely active and alive," and then adapt that cause to positive naval use. The task done, military character is the result.

The fitting of round pegs into round holes calls for a certain broad-mindedness. It may be that there is no room for a particular man's talents in the division, but ample scope elsewhere. No consideration of "leaving me a vacancy" should ever prevent the transfer of the man to the place where he is best fitted to develop.

I have mentioned the characteristic of restlessness. This, a typically American trait, is to be expected, especially in men who come into the naval service. If they did not have it in a marked degree, they would never have come into the navy. This attribute frequently manifests itself in the desire of a round peg, believing his hole to be square, to want to change his hole. This is a problem that the division officer cannot dismiss instantly. He must investigate carefully. If he finds that even at the expense of some trouble he can find another round hole for the man, the change should be made, for in the long run it will pay in choking incipient discontent. Monotony in occupation and its bearing on inefficiency is being given increased attention by industrial leaders. A study of this factor in the navy is worth while. The point came to me forcefully in connection with a certain machinist's mate first class. His previous occupation was that of instrument maker. He gravitated almost instantly to the operation of a Rivett precision lathe in the battleship's machine shop. Here the quality of his work was a delight. It seemed to be an ideal job for him. After a few months he manifested great but respectful discontent. Investigation showed that he was not getting what he came into the navy for. Instead of obtaining marine experience, he was doing what he had always done but under less favorable conditions. Investigation further showed that by his excellent work he had created a demand for his services. He was engaged in manufacturing small machine parts that could be requisitioned or purchased at much cheaper cost to the govern-

ment, so that he was really doing somebody else's work at greater cost. His transfer to an operating station cheered him up, stopped a waste of labor, and allowed him to develop his knowledge of marine engineering. Every case of this kind will bear patient investigation, and will pay dividends in results.

Nothing kills a man's spirit quicker than to hold him to a job, manifestly below his capacity, simply because he fills it satisfactorily.

Explaining the Man's Relation to the Whole Organization

Many billets in the navy are of necessity monotonous repetitions of the same old thing in the same old way. The average man tends to a treadmill existence, and not being a philosopher, does not see his relation to the whole organization, be it the ship, the fleet, or the navy. Systematic instruction should be given the division, explaining the relation it bears to the ship, and the relation of the ship to the fleet. Emphasis should be laid on the fact that the whole is but the sum of its parts, and if any part fail, the whole fails; and that these monotonous jobs are necessary parts of the whole. Notwithstanding we live in an age of advertising, the bulletin boards have not been developed to their full capacity. There is a big field open in using the bulletin board to "sell ideas." They are used concretely to stimulate interest in competition, but their use can be extended much further. Consider maneuvers. I venture to assert that the average man pays no attention to them, or if he thinks about them at all, believes that they are designed for the peculiar entertainment of admirals and captains. A popular exposition of this subject in the form of a five-minute talk at the close of loading drill, or a simple diagram put in the division bulletin board occasionally will help to keep men going steadily in their daily grind. Man does not live by bread alone. Monotonous work must be salted with ideas.

The Why of Orders

The average American youth is not distinguished by a passionate desire to obey orders. Quite the contrary, he does not like to obey orders. However, once it has been ground into

his consciousness that orders are not given to annoy him, but because a positive necessity exists for them, he is keen to obey. This happy state of affairs can be reached only by patient teaching. Mr. Fred J. Miller, in a paper read before the American Society of Mechanical Engineers, said,[2] "In a recently published magazine article the difference was clearly shown between the having a foreman tell a group of workers that they must work overtime and, on the other hand, allowing the workers themselves to pass to each other and read a letter from a customer saying that unless his order was shipped by a certain date he would consider himself at liberty to cancel it. The workers decided to work overtime to prevent cancellation of the order." This illustrates my point pretty well. I want to make clear that I am not advocating the "sovietizing" of a military service. We all realize the necessity for instant obedience in the navy, even at the expense of considerable pain to the individual; but to reach this state occasional explanation of the necessity for an order, or orders, is desirable with the American temperament. Confidence in authority can be obtained quickly in this way.

Useless orders tend to destroy confidence. I am convinced that seniors irritate juniors more by encroaching on the sphere of the subordinate's initiative than in any other way. This irritation is not peculiar to the ranks of the commissioned. All of us have seen an officer change the method of a petty officer for one of his own not a bit better and sometimes worse; and we have noted the look of irritated and weary patience with which the petty officer made the change. Often enough the order has been given not to the petty officer, but to one of his men, adding insult to injury. To sum up, men must be educated to obey orders, useless orders must be eschewed.

TRUTH IN INTERCOURSE

In all dealings between division officer and men there must be absolute frankness. This is commonly expressed as "laying all the cards on the table," but I prefer that fine phrase of

[2] "Prevention of Waste in Industry," address delivered by Mr. Fred J. Miller at annual meeting, December, 1921. A. S. M. E. *Mechanical Engineering,* Vol. 44, No. 1.

Stevenson's "truth in intercourse," it so squares itself with the military ideal. All men hate to be fooled, and just as thoroughly do they hate a fourflusher. It is best to know, better to confess ignorance of a point, and worst of all, to bluff.

It is somewhat of a commonplace that men are not deterred by the difficulty of a task. Usually difficulties spur them on. Practically all writers on morale agree on this, but something more is needed. The leader must frankly admit to his men the difficulties of the task. If he attempts to belittle it he immediately arouses opposition. Wounding a man's intelligence is just as fatal as killing his pride. The leader must admit the difficulties, and proclaim his faith in the ability of his men to overcome them. I have seen the truth of this statement exemplified on several occasions. The most striking was the case of an engineer officer who was faced with the care and operation in active commission of one of our most notoriously poor destroyers. After inspecting the plant, he called the engineer's force together, and publicly admitted the worst that could be said of the plant both as to design and workmanship. He went on to state that it would be necessary to work them overtime frequently, that on many occasions the deck force would have liberty when they would not, but that he believed that they could make that ship run, and that some day they would get liberty when the deck force did not. The men responded to the appeal. That ship went six months out of Queenstown without a breakdown serious enough to force her back into port, or to cause her to lose a trip at sea, when better designed and better built craft broke down. It took sixteen months to redeem the promise that the engineer's force would have liberty when the deck force did not, but it was redeemed. To a surprising degree men react as they are treated. If they are treated like children, they act like children. If they are treated like men, they act like men.

Frankness suggests courtesy. Politeness and firmness are not incompatible. I shall never forget the extremely courteous manner with which a British captain issued an order to one of his men. He used the word "please," I remember. I was somewhat surprised, but as I thought about it afterwards, I had a distinct recollection of a tang of discipline about that "please."

COURAGE

Heretofore everything I have had to say seems to have had some bearing on confidence. But what of courage? There can be no courage without confidence; but with a foundation in confidence, courage follows. Courage seemed so common in the late war that there is a tendency to underestimate it, especially physical courage as contrasted with the so-called moral courage. There is need for both in the naval service. Psychologists tell us that fear is due to ignorance of the unknown. If this be true, the custom in navies of former times of having men witness the slaughter of animals for food, to habituate them to the sight of blood, was a crude realization of this truth. Peace training should simulate war as far as reasonably possible, to the end that the unknown factor be hunted down. I do not mean that this should take the form of undue severity or extreme hardship, but that everybody should be on thinking terms with war, men as well as officers.

TENACITY AND ZEAL

Peace-time training affords every opportunity for drill in tenacity and zeal. There should be no sharp transition in regard to these qualities from peace to war. There is possibly a slight danger that tenacity and zeal be carried too far and end in needless hardships; but not much. Needless hardship is stupid. Stupidity in leaders kills confidence.

THE PART OF THE OFFICER

The division officer, the last commissioned link in the chain between higher authority and the man, is in a position to see the latter's outlook. He should constantly strive to sense it, and endeavor to change it where necessary. He can do this only if he possesses the faculty of transplanting himself into the man's position, literally putting himself in the latter's boots and reconstructing his reactions to the reactions of the man. I was once a messmate with an officer who had this characteristic in a marked degree. He had a positive genius for getting the outlook of the men. "Mr. X ain't like other officers. He's too common," said one of his men. His ability in this direction was so unusual that to some it seemed unofficerlike.

The faculty of catching the point of view of the man does not mean that an officer is handicapped. It is a great asset, but it must be balanced by superior ethics. It is quite possible that some of his subordinates, specialists, know more than he does of certain subjects; but in morale and ethics he must be superior or his leadership fails. This may sound snobbish, but it is, after all, the foundation of a military aristocracy.

Loyalty has been preached and preached, but the usual preachment has narrowed to loyalty up. Perhaps this greater emphasis on loyalty up is necessary; but loyalty down can never be forgotten. The division officer should never forget that his division is his gang, that he is their leader in fair weather and foul, and that if he does not specially represent them on certain occasions, nobody will. To gain loyalty, he must be loyal. On the other hand, his sense of proportion should prevent his ever assuming the altitude of my division, right or wrong, but my division. The great end is service of the whole ship, and the whole fleet.

A former executive officer of a battleship told me that men who by-passed their division officers and brought their troubles and requests directly to the executive officer invariably came from the poorer divisions. Loyalty down, pays.

In the course of this paper I have frequently stated that a division officer in the face of certain conditions should make representations to higher authority. This is based on my conception of the place of the leader of a large organization, as one who lays down general policies, leaving the details to his subordinates, but who exercises the additional function of review and revision. If this idea be correct, it is a paramount duty of the subordinate to point out adverse conditions, always if possible bringing a concrete solution for the difficulty. This always requires tact. But tactful dealings with seniors is without the limits of my subject.

I have purposely omitted any discussion of the value of athletics as a morale builder primarily because it seems to me that athletics is emphasized enough on the average ship, and secondarily because there is a tendency to regard sport as the easy solution of morale. There is no easy solution. In regard to athletics the division officer should steer a middle course. He should encourage participation in sport, and loyally co-operate in all organized

forms; but he should constantly bear in mind that these activities are not ends, but only means to an end.

How is the presence of high morale apparent? It is known by little occurrences such as a man's insisting on re-rolling tubes in a steam drum while at sea in submarine waters; by an old Swedish fireman one half an hour after a destroyer was nearly cut in two asking a mate, "Have dey given de word to yump yet?"; by the spirit of cheerfulness with which a division attacks a long and disagreeable coaling. It is said that it is the marketing of the last ten per cent of production that pays dividends, while the other ninety per cent pays the cost of production, fixed charges, and overhead. You may drive as high as seventy-five per cent out of a man; but he has to give the rest freely. Morale, earnestly striven for and properly cultivated, will bring out the one hundred per cent.

To sum up, morale is intimately bound up with leadership. Leadership does not exist unless morale is achieved. Morale is based on certain fundamental mechanisms of daily living in the naval service. Unless these mechanisms function smoothly there can be no morale. Morale further depends on more illusive adjustments of the individual minds of men. The division officer must first build his physical foundation, and then just as surely build up the less tangible superstructure of his edifice.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EX SCIENTIA TRIDENS

By Lieut.-Commander C. B. Vroom, U. S. Navy

Now that Edison has invented a machine for communicating with the dead, perhaps we shall be able to savvy math.—*The Log.*

The natural reply to this variation of a standard joke (since math, in our technical profession, is very much alive), is, Well?

I

Every year the problem of education becomes a trifle more difficult, because of the increasing demands of the service. That difficulty is to be met only by consolidation and co-ordination of the departments for the purpose of cutting down duplication and consequent waste of time.

There is, however, another difficulty, one that as yet has received no consideration, or at least none that has resulted in improvement. For ourselves we admit that the basis of the alleged joke exists in fact, and that the main difficulty for immature minds (and not a few maturer ones, our own included) is the inability to look upon the several branches of science as living things, *as they are presented.*

That this difficulty exists there is plenty of evidence. In the field of pure science, mathematics for instance, nothing new has appeared for years. Yet the flood of text books continues to rise, and to date no satisfactory ones have been found. The newest differs from its predecessor in binding and arrangement, and will be succeeded by yet another in a year or two. *Its* contemporary generation of students will consider it as a tomb, and the *Log* of that day will furnish a suitable epitaph.

It is proposed to examine the subject of education from the point of view that the mission of the Naval Academy does not

change; that the material never varies; and that an educational institution that exists solely for the purpose of supplying thoroughly trained engineers (in the broad sense) does not completely fulfill that mission. That the same condition exists as regards the universities is shown by the frequent discussions that appear as the value of the university-trained man compared with the man who has not had a higher education than grammar- or high-school. Perhaps the colleges can do no better than they are doing; at any rate the majority of executives are dubious as to any special advantage attaching to a college education. It has frequently been stated that a college graduate must spend as many years learning *after* he has graduated, as the man who enters the business world as a high-school graduate. Not only that, but he frequently has to *unlearn* some ideas that he absorbs in college.

Of course the navy must have men who have a thorough technical training that only the Naval Academy can provide. The point is, that the Naval Academy has a tremendous advantage that the universities do not have. It can turn out men who are maturer than the average college graduate; and it can see to it that there shall be no ideas to be unlearned. There is one course in the curriculum not taught elsewhere; *responsibility*. There are really two sorts of education; one that prepares the student for a definite occupation, and one that fulfills the literal meaning of the word, namely, to lead out the minds of the student. If some of the notions, ideas, and characteristics of the adolescent mind that generally persist throughout student days can be corrected *during* the course at the Naval Academy, instead of allowing the hard school of experience to do it after graduation (as the colleges are forced to do), two ends are gained; the graduate becomes of some practical value much sooner, and, *he gets more out of his technical course of instruction,* while he is an undergraduate. The characteristics of the immature mind have been summarized to include supreme indifference, a lack of appreciation of responsibility, superciliousness, and lack of judgment. All of which are childlike qualities. The imposition of *responsibility* is the best corrective.

The mission of the Naval Academy can be summarized in a few sentences; to send out to the fleets young men trained in scientific

methods and the *use* of books, with sufficient technical knowledge to become proficient in the various branches of engineering that they will be called upon to practice; and with correct ideas of personal responsibility, and a wholesome regard for the traditions and unwritten laws of the service in the matter of personal honor and conduct.

The raw material never varies, considered in the mass—at least not appreciably. One eighteen-year-old boy is pretty much like another, the world over, so far as his mental *qualities* are concerned; he may, and does, vary enormously in mental *capacity*. But he is far from being mature, whatever he may think of himself. He has the stature of a man, but several unmistakable qualities of a child. One of the most important duties of the Naval Academy is to eradicate the childish qualities. It must be recognized that to do this in four years is in itself quite a task (one that the colleges have not found possible); also that an immature mind cannot reason logically. Yet, from the first, it is necessary to begin the technical and scientific education demanded by the naval profession; to present abtruse subjects in large doses to minds bewildered, unaccustomed to reasoning, and in too many cases, not sufficiently grounded. This is the second difficulty heretofore mentioned.

II

The methods of presentation of the subjects taught have been frequently discussed; it might be said incessantly argued. Probably there are as many opinions as there are officers. As to whether officers who are not especially interested are as competent instructors as they ought to be, is another question much discussed. There is no question but that they *ought* to be as competent as civilian specialists, and there are some subjects that they are especially fitted to teach, such as navigation and ordnance. It depends largely upon the individual. There is this difference between teaching in civil institutions and the government academies; in the former the instructor *must* be thoroughly equipped; in the latter he *may* be merely a referee between the student and the letter of the text.

Are text books all that they should be? Do they present in as clear a light as possible, for the consumption of immature

minds, the essential points and facts of their respective subjects? Or do they convey the general impression given in the alleged joke at the beginning of this article? We incline to the belief that nearly all text books, especially in technical subjects, are written in a "style" best calculated to discourage a seeker after truth, let alone a harassed, bewildered youth. Lincoln's method, in analyzing the political questions of his day for the erudition of assorted audiences was "Speak so that the lowest may understand; the rest will have no difficulty." Not a bad method for educators to adopt in their works.

How many and many a time have you followed through an elucidation and brought up against "Therefore it is obvious," followed by a string of symbols that were *not* obvious? If you happened to be looking up something that you needed, you probably went to someone to explain it; but if you happened to be a midshipman, you memorized that string of symbols; it was here today and gone tomorrow, a nebulous equation without any particular meaning or connection with anything past or to come. That a proper understanding of that principle might be necessary for further use was a matter of supreme indifference.

Frequently the very English is obscure; legions of technical terms appear without the slightest attempt to define them. The student is bewildered by words of whose meaning he has not the slightest idea, used to demonstrate propositions obvious only to the writer, who assumes mental processes similar to his own, not to mention an interest and scientific knowledge that the beginner, old and young, has not got.

The argument is often advanced that digging the work out is part of the instruction. It will *not* be dug out. The student as a general rule has neither the time (especially in the Naval Academy) nor the interest (in any undergraduate institution). In elementary text books every fact should be so clearly demonstrated that any one old enough to study the subject at all shall understand it; every technical term should be clearly defined. Every reasonable means should be employed to force home the fact or principle; if homely simile or colloquial language will make it stick in the memory, then abandon the formal style of science. Plenty of seventeen-year-olds can see at a glance the theory of a see-saw, who are shy with the "theory of moments" even after

being properly introduced to it. Of course this is not propaganda to have physics set to music or astronomy put into nursery rhymes. It is simply an argument to the effect that immature minds cannot have facts too plainly set before them, or too forcefully driven home. Memory is largely a matter of association, except in the case of the parrot.

Inasmuch as nearly all textbooks used at the Naval Academy are either written or prepared (with due acknowledgement) by naval officers, the matter lies entirely in the hands of the navy. Text books come and are supplanted; the material is the same.

III

The problem of classroom technique is harder than the text book difficulty. For a given class in a given year there is *one* text book; but twenty instructors. An arrangement whereby an instructor handled about ten students would be the best, under the Naval Academy system, and further, offers the greatest possibilities. But even with no more than ten to a section, it is practically an impossibility for an instructor to assure himself that every midshipman has got the essence of the day's assignment. If the instructor attempts to answer every question that every midshipman wants to ask—those who have tried it know what the range would be—he finds that the students are adepts at killing time, and that a general discussion of the day's lesson quickly becomes a covert criticism of the course in general, and the last examination in particular—and here we have another manifestation of the childish mind. This is one extreme; the other is the system of refereeing between the midshipmen and the book. Somewhere between, lies the best method. The best has to be discovered by each instructor for himself; and this is an argument often used by those who hold that a civilian is a better instructor than an officer; by the time that the latter has evolved the best method, he goes to sea again.

Week after week, when the marks are posted, the sections run to a surprising similiarity of proficiency, due to three factors: the policy of the department as to what the midshipmen ought to do; what the instructors think the midshipmen are doing, and because the *sections* are pretty much alike. The *sections* run to an average, *but there is probably no such thing as an average*

midshipman. That is to say, in *any* section there are best minds, mediocrity, and the submerged tenth. The first run true to form consistently—superior mental capacity, industry, and maturity. The last are equally consistent—dull, childish, careless, indifferent. Mediocrity is in the majority; he is the instructor's real problem, the fellow who is trying, but cannot quite keep the pace for any one of a number of reasons that it is the instructor's duty to discover if he can. There is not much use in wasting time with the hopeless element; if it is not hopeless because it wants to be, there is always the extra instruction period. The point is to get the lesson across to mediocrity. It is easy to find out how much the bright men know; how little the indifferent or stupid man knows, but it is extremely hard to find out exactly what mediocrity does *not* know; *why* he does not, and then see to it that he does, all in one recitation hour.

The usual argument that midshipmen must be given a mark and therefore there is no time for instruction is a good one: provided the mark is intended to strike an exact balance every recitation between the midshipmen and the book. Even so, with a large number of instructors there is certain to be a wide divergence of methods, and in any case there can be some attempt at standardization, if only by informal discussion and the formulation of a departmental policy, or, better yet, a Naval Academy policy. But it is not admitted that every midshipman should have a mark every recitation, based solely on what he is able to commit to memory and retain long enough to put on the board. His mark for the month, including the examination mark, should show his *proficiency,* as well as aptitude, industry and interest. Nor does he necessarily have to know *when* he is to be given a mark, because some of him (collectively speaking) would prepare especially for the occasion, being human, and immature to boot. There is no intention of formulating a best method, but there is no harm in starting an informal discussion.

Suppose, to utilize a recitation hour to the best advantage, a section (after the usual questions regarding the next examination are answered), is given a written recitation. At the end of twenty minutes the majority (all but the submerged tenth and some of mediocrity) will have finished, and the remainder of the hour can be devoted to instruction. All the points of the

day's assignment can be brought out, discussed, *explained*, in the course of cross-examination; and incidentally points of previous lessons that have a direct bearing on the current work. Ambiguities in the text (there are plenty of them) will appear, and can be cleared up at once. Thus the individuals will not have the excuse that they cannot understand the text, but best of all, abstruse subjects will be brought to life because some interest can be injected into them, and a machine for communicating with the dead will not be needed. If marks are to be assigned, there is the written recitation as a basis.

IV

The best instrument for teaching responsibility, and for developing latent mature mental qualities, is the summer practice cruise. If conducted solely in the interest of training, it is a course with possibilities beside which the summer field courses of the best technical schools fade to insignificance. Theoretically the cruise is conducted in the interest of midshipmen; practically it accomplishes scarcely a single aim. This conclusion may seem to be a hasty and radical condemnation of a part of the Academy course that is well established and generally carefully planned. Perhaps it should be qualified in the sense that the possibilities are not attained, however well the planning may have been done. In view of the fact that the character and results of any given cruise often depend on the exigencies of the Navy, it may be that this non-attainment is unavoidable. Nevertheless the great importance of undergraduate training seems to be in itself an exigency of the service, upon which some others might be made to wait.

What can the cruise accomplish, besides the inculcation of the sea-habit and the laws of the navy? For one thing, it can take the technical subjects, even math, out of the classroom, and infuse some of the color of life into them, but only by making the student see for himself that there is some real connection between theory as taught in books, and practice in handling the machinery of a ship. Plenty of people ride in street-cars who know nothing and care less about the motors that make the wheels go round; plenty of midshipmen return to September leave with no more tangible acquisition than a handful of suitcase

labels. They have been passengers. There is no denying that they have stood watches; that is, as rather bored spectators; such interest as the street-car passenger feels when something goes wrong.

The conclusions as to the practical value of the cruise are based on the observation of seven practice cruises, including one in a sailing ship; three that were carried out in a squadron officered and commanded by officers in immediate touch with the Naval Academy; two in which midshipmen were distributed to ships of the fleet, and one for which a division of the fleet was assigned for that purpose. The latter is perhaps not a fair criterion because of the peculiarly unfortunate itinerary and enlisted personnel situation.

The best system is unquestionably the organization of a practice squadron composed of ships suitable to the purpose, not any that happen to be available regardless of fitness. Have it commanded and officered by the Naval Academy personnel. Then co-ordinate the summer's work with the Naval Academy instruction, and make that schedule as rigid as the schedule of classroom work, not to be broken except under circumstances that cannot reasonably be foreseen. Throw the note books overboard; anybody who can write can copy information out of a text book. Make the midshipmen do the work to run those ships, and rate them on ability, interest, and personal character, just as in the case of the performance of duty by commissioned officers, choosing standards suitable to the age and experience of the students.

The practice of sending undergraduate midshipmen to the fleet is the paramount consideration, the needs of the midshipmen a very small one indeed. The midshipmen gain false impressions in the fleet. As they are unable to realize that they are not officers, but officers in an extremely qualified sense, they are aggrieved if not allowed the privileges and comforts of the steerage. Last and most important, they either become stop-gaps to fill vacancies in enlisted personnel, or they are essentially passengers. They get no responsibility; no practical training with their hands (except on the end of a shovel, perhaps). Why? Because no commanding officer in a ship in the fleet is going to risk his fitness report on bad steering, worse signalling, and poor engineering performance. But steering and hundreds of

other matters are arts not to be acquired by observation or book-learning. The business of the fleet, preparation for war, can hardly be subordinated to the training of undergraduates. The result is that the midshipmen become messengers when they are on watch, or at most learn to read a stadimeter. In a *practice ship*, under proper supervision, correction and instruction, the midshipmen can make all the mistakes that every one *must* make while learning, before going out to assume full responsibility.

Furthermore, in the matter of the practice cruise, select an itinerary such that the ends of instruction, diversion, and reasonable recreation are best served. The wishes of chambers of commerce might well be made secondary considerations.

DISCUSSION

A Plea in Defense of Paper-Work

(See Page 621, Whole No. 230)

Lieutenant Commander R. S. Edwards, U. S. Navy.—I regret to read in Lieutenant Carmine's paper his opinion that our ships in the Grand Fleet took no detailed data and made no searching analyses of results of target practice; that "ships simply went out and fired and were observed if practicable"; that British ships "never bothered about observers, times, check sighting, safety precautions and the like"; that the British had a "modified" system for recording observations for target practice.

If this be the general impression in our navy, it is no wonder that there is objection to the paper-work of target practice. The British battleships did good shooting in 1918, whatever may have been the case at Jutland. If it be that they could shoot without vexing their souls with paper-work, why should we cling to the morose custom of post mortem reports?

It sounds attractive, but the flaw in the argument is that, like much of the mythology of the Grand Fleet, the story has become mixed in the telling. As a matter of fact, the British ships conducted practices in accordance with carefully laid plans—most elaborate plans in the "throw-off" firings of which Lieutenant Carmine speaks with disfavor. They had observers. They took careful records, not unlike our own. And their analyses were most minute. Our own ships in the Grand Fleet fired under our own rules, modified to some extent it is true, but not at the expense of record keeping.

The Grand Fleet, after four years of permanence of personnel and immunity from flower shows that can not be approached remotely in time of peace, had reached the state of organization and efficiency of staff work that enabled the admiral to direct target practices and other operations with so little sparking at the commutator that there seemed to be a pleasing ease and informality about the proceedings. But behind it all were careful plans, the result of study of past performances. The interpole was paper-work, not the lack of it.

The Grand Fleet in 1918 was an excellent example of the value of statistical study of operations, rather than an argument against paper-work as might appear from Lieutenant Carmine's remarks.

I disagree with the author in his suggestion for improvement in the way we handle our paper-work. It is not that our gunnery people do not study past performances. They do—most of them. And they swallow a lot of the chaff of misinformation along with a few grains of truth. Most target practice reports are anything but a history of what happened.

The business of recording a practice is as difficult as conducting the practice. When the records are made by observers that are not trained to record, as is too often the case, they are as likely to deceive as to enlighten.

The remedy for this is simple and has been tried out on many ships. It consists in having an observing party, organized as permanently and drilled as frequently as the gun crews. For example, in preparing for long range practice, detail your aft turrets to observe the forward turrets on your own and on other ships. Detail your aft fire control group to observe the forward group. On some of your drill rehearsals fire half the turrets at a time, using the other half at their regular observing stations. Require that a complete report of the rehearsal be prepared in pencil, omitting nothing that can be simulated. You will find endless mistakes in observing the first time, and who made them, and why. You can drill these mistakes out of the organization just as you can drill mistakes out of a gun crew. Then you can go to observe the firing of another ship with reasonable assurance that your report will be a study of the practice, not a useless comedy of observers' errors.

The General Board

(SEE PAGE 792, WHOLE NO. 231)

REAR ADMIRAL RICHARD WAINWRIGHT, U. S. N.—Admiral Taylor in discussing my sketch of the General Board endeavors to refute two of my statements. His quotations from the records cannot be contradicted, but it is not just to state that the question of the displacement of the torpedo boats did not come before the Board on Construction because he did not find it on record with the record of the contract dispute. It is a fact that at a meeting of the Board on Construction at which Admiral Matthews, Admiral Chadwick, Chief Constructor Hichborn, Chief Engineer Melville, and I, chief intelligence officer, were present, the question was considered and the decision was as I have stated. I am positive of this except as to the presence of the engineer-in-chief. Admiral Matthews said he would report our decision to the secretary and Chief Constructor Hichborn said he would make a minority report. I was told that these reports were made and that the minority had been approved by the secretary after hearing what Admiral Taylor calls an "absurd argument." I was told that afterwards Admiral Sampson induced the secretary to change his decision. I am the only living member of the Board of 1896 and I can only vouch for the subject having been discussed and the decision reached; the rest was told me. The records as quoted by Admiral Taylor show that the secretary first decided for the smaller boats and that after Admiral Sampson had favored the larger boats the secretary changed his decision by 66 2/3-33 1/3—not a 50-50 decision as I stated. "A remarkable illustration of the fallibility of the human memory"; 16 2/3 dropped in over twenty-five years.

As to the war plan. Like Admiral Taylor I have not searched the Hale committee's record, but I have read carefully the admirable report of that committee and that there was a plan which was lost, is established. That this plan was found in Secretary Daniels' desk may quite possibly be a "galley yarn." That there was a plan and that it was lost and not adopted is the point of importance. The character of the plan I cannot prove but the probabilities seem to favor that it was a plan for putting the American navy in condition for waging war effectively. As the members of the General Board were not prophets they naturally waited until we entered the war and could obtain full information from Allied sources before making plans or recommendations as to the employment of the fleet.

The opponents of a General Staff always raise the bogey of a rubber-stamp secretary. A proper General Staff system adds to the power of the secretary by furnishing him with well considered advice and acting for him when he is in accord with the General Staff. When the chief of staff does not act in accordance with directions he should be removed and when the secretary does not accept his advice in matters of importance he should resign. The country would then always know who was responsible for acts of importance. I believe the chief of operations under the present law would be as "wholly powerless to do anything except routine work" without the consent of the secretary as Admiral Fiske was under the aid system. The present system is stronger than the aid system from being legalized; but it is a "step backwards" as the bureaus are not directly subordinate to the chief of operations.

No law can make a good secretary but a good system stabilized by legislation would be an enormous help to a good secretary in his efforts to maintain an efficient navy and to control its operations.

U. S. NAVAL INSTITUTE

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The Institute desires articles of interest to all branches of the service, including the reserve force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

All articles and discussions submitted by persons belonging to the navy for publication in the PROCEEDINGS must be in duplicate, one copy being signed by the author, which will be submitted to the Navy Department when the original is published, as required by General Order No. 46, of May 20, 1921.

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The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the secretary and treasurer of the number of reprints desired when the article

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ANNAPOLIS, MD., June, 1922

INFORMATION INDEX

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PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT R. A. HALL, U. S. NAVY

GENERAL ARRANGEMENT

FRANCE

SHIPBUILDING.—The shipyards and arsenals are so far removed from the centres of raw material supplies that they are admittedly unable to compete for foreign contracts, although their situation is so precarious that every possible means has been suggested of enabling them to secure foreign business, without which it is feared that the shipbuilding industry will languish indefinitely. Something has already been done to help shipbuilders by reducing the railway rates on raw material, but the cost of construction is still too high to permit of builders competing with British shipyards. It is now alleged that, in hastening through the first part of its naval programme, the object of the Government was to prevent the closing down of some of the arsenals which are regarded as no longer serving any useful purpose. Instead of giving all the work to private shipyards that are badly in need of employment and can construct much more cheaply than the arsenals, these latter are to build a certain number of vessels that will require the presence of a costly naval staff. Cherbourg is to build four submarines, Brest two light cruisers and one submarine, L'Orient one light cruiser and two destroyers, and Toulon one submarine. Private shipyards will build four destroyers, twelve torpedo boats and six submarines.—*The Engineer*, 12 May, 1922.

SPEED OF THE NEW CRUISERS.—Whilst progressive officers see a mistake in the adoption of the 6-inch calibre for the 8,000-ton cruisers just ordered, and find no great consolation in the knowledge that these ships will have their artillery and motors better protected than is the case in the British *Raleigh* and American *Richmond,* they confidently expect to see France beating all speed records for cruisers, and speed in the eyes of many is the most important of strategic and tactical factors. It was not superiority in gunpower, but speed—and speed alone—that enabled the *Goeben* and *Breslau,* a relatively puny force, to escape from the Franco-British chase into the Dardanelles and thereby change the course of the war. So the

next light cruisers are to be blockade-runners and to maintain against all comers safe communications between France and her vast colonial empire. To that end special care and no end of comparative experiments have been devoted to the designing and installation on board of the eight small-tube oil-fired boilers and improved turbines that will, considering their enormous power, occupy an abnormally small share in the displacement of the future ships, as well as a reduced personnel. Each boiler will develop 12,500 h.p. under easy conditions, and the designers will be disappointed if the total motor power of 100,000 h.p. does not produce a sea speed of 35 knots, even when the ships put to sea at their full load displacement of 9,600 tons, especially when is considered the trouble taken with tank experiments with a view to determining the hull shape and lines most favorable to extreme rate of going. It has been found possible to conciliate high speed with habitability and fighting endurance. In this respect the experience of the Falklands and of the Adriatic operations has been remembered and put to good use. One or two encounters would not empty ammunition bunkers and mean powerlessness, all the more so as the new 6-inch shells have benefited with recent armour and pyrotechnic improvements and are deemed superior to the 7.6-inch projectiles at present in service. In truth, oil fuel still counts opponents in high quarters, notwithstanding the conclusive demonstrations made in the Lorraines, and coal-fuel designs have been proposed, but the problem proved unworkable, as no less than 50 boilers, echelonned over 150 metres length, would have then been required, together with a personnel of 700 men, to produce over 30 knots!—*Naval and Military Record,* 12 May, 1922.

SEA-KEEPING QUALITIES.—The presidential cruise in the 14,000-ton and 22-knot armored cruiser *Quinet* has brought to light several interesting naval lessons, and notably the value of homogeneity and high freeboard in warships. On the way from La Pallice to Casablanca, over a distance of some 1,200 miles, very rough weather was experienced, with the result that the high freeboard, roomy, and robust *Quinet* arrived alone in view of the Moroccan coast, at scheduled time and at a speed of 21 knots, having left far behind the slow accompanying liner with a full cargo of sea-sick parliamentary men and official guests, and also the escorting flotilla of ex-German destroyers of 900 tons, headed by the 2,500-ton *Sénès.* These Boche-built craft are exceedingly fast on paper, and in fair weather good yet for about 30 knots. On the other hand, they behave badly in heavy seas, and are even dangerous, for the twofold reasons that they are low above water amidships and that they feel very much, while rolling and pitching, the weight of the three 2-ton, 105-mil. guns which they carry high up on their back. If anything, matters were worse on board the 2,500-ton and four 6-inch gun *Sénès,* that has revealed herself as a fair-weather boat requiring careful handling. Their defects are not due so much to overgunning as to hasty, faulty designing, as the French *Lestin* (900-ton, 82 mètres length), though mounting a similar armament to that of the Boche-built *Delage* (990 tons, 92 mètres length), has more freeboard and is a better sea boat. The same applies to the *Aventurier* type (ex-*Mendoza*) of under 1,000 tons, that mounts four 4-inch weapons. On the other hand, it is to be remarked that those great navies, such as the British and American, known as "strategic fleets," built for the command of the sea and for extensive radius of action, have all along preferred sea-keeping power and robustness to excellence in the matter of armament; and, as a counterpart, a purely Mediterranean fleet like the Italian, with limited strategic aims, surpasses all rivals in the military utilization of displacement.—*Naval and Military Record,* 10 May, 1922.

FRANCE'S IDLE TONNAGE.—On March 1, 529 vessels of 1,102,568 tons gross were laid up in French ports. All but four of these flew the French flag. The showing of the leading ports was as follows:

	Vessels	Tons
Dunkirk	48	181,564
Boulogne	4	2,464
Havre	35	120,961
Rouen	5	7,117
Cherbourg	2	5,262
Brest	57	125,847
L'Orient	7	6,315
Saint-Nazaire	67	173,215
Nantes	50	107,156
La Rochelle	10	9,312
Bordeaux	20	46,177
Bayonne	4	3,001
Cette	4	1,774
Marseilles	116	249,306
Algiers	3	5,648
Oran	6	2,858

This fleet of inactive French vessels was made up of 286 steamers of 816,860 tons, 151 sailing ships of 184,595 tons and 82 other craft of 84,032 tons.—*Nautical Gazette*, 27 May, 1922.

INQUIRY INTO DISASTERS TO FRENCH CARGO BOATS.—French shipping circles have been greatly disturbed by the sinking on April 25 off the coast of Brittany of the cargo steamer *Député Albert Tallandier* with a loss of fifteen of her crew, while bound from Rotterdam to Brest with a cargo of coal. She is the third vessel of what is known as the *Marie-Louise* type to have foundered during the last few months and others have figured in the casualty lists.

It would appear from these disasters that the *Marie-Louise* vessels are lacking in stability. M. Rio, under-secretary of state for the merchant marine, has therefore decided to appoint a commission, composed of two mercantile marine officers (deck and engine-room), two engineers and a representative of a classification society, to look into the causes of these accidents. Pending the results of this inquiry, the *Marie-Louise* vessels, of which there are thirty in service, built for the most part in French navy yards, are to be laid up. They are small colliers of 2,170 gross tons, 270 feet long and of 39 feet 6 inches beam.

According to the testimony of the survivors of the *Député Albert Tallandier* the vessel left Rotterdam with a slight list to port which gradually increased. When the captain tried to rectify this list by shifting the cargo, the vessel keeled over to starboard to such an extent that she could no longer be righted. Shortly after she went down bow first. It is suggested that the cause of the disaster was a defective bulkhead which allowed the boiler feed water to shift from one side to the other.—*Nautical Gazette*, 27 May, 1922.

GERMANY

GERMANS BUILDING EIGHTEEN LARGE MOTORSHIPS.—According to Dr. Hans Stolzenburg, correspondent of *Pacific Ports* in Germany, there are at present eighteen large motorships under construction in German yards, of which about one-half will be completed in the course of 1922. Most of the new vessels are being built by the Deutsche Werft. This yard is constructing three freighters of 4,500 tons gross each for the Hamburg-American line, two tankers of 3,500 tons gross each, and three tankers of 2,800 tons gross each for other contractors, as well as a tank vessel of 2,300 tons gross for the oil works of Julius Schindler.

The Deutsche Werft is also building two freighters of 4,500 tons gross each with two motors of 1,700 h.p. each for the Kosmos Line. Two ships

of 9,000 tons gross each have been ordered from the Reiherstieg Schiffswerft and Maschinenfabrik, Hamburg, by the Hamburg-Sudamerikanische Dampfschifahrts-Gesellschaft. They will be equipped with two two-cylinder Diesel motors of the Sulzer type of 2,600 h.p. Messrs. Blohm and Voss, Hamburg, are constructing a motorship of 6,500 tons gross with two motors, of 1,750 h.p. each for the Hamburg-American line. This vessel was launched recently and was named *Ermland*.

A freightship of 6,300 tons dead-weight, destined for the Norddeutsche Lloyd, will be completed by the Vulcan Werft, Stettin. The A. G. Weser, Bremen, is occupied with the construction of a freighter of 6,200 tons gross with two motors of 1,600 h.p. each. Lastly there is being built in the yard of C. Tecklenborg A. G., Geestemunde, and the Howaldtswerke, Kiel, for the Hansa Line, Bremen, two motor vessels of 6,200 tons gross each with motors of 1,600 h.p.

The total German motorship tonnage is about 90,000 tons gross. In England there were 29 motorships of 133,991 gross tons under construction on April 1.—*Nautical Gazette*, 13 May, 1922.

ALLIES' BAN ON BIG PLANES BRINGS GERMAN REPRISAL.—Forbidden by the Allies to construct large aeroplanes for commercial purposes, the German Government has countered by closing German territory to all aerial transport by large planes. In diplomatic wording this means that the Germans answered the Allies: "We cannot fly and neither can you, because our restrictions will prevent the French and British extending several of their international passenger services, notably those to Prague and Constantinople."

The Germans claim that the Allies' restrictions as to size would kill commercial flying. They hope, therefore, to force a modification of the terms, so that commercial aviation in Germany may not be suppressed altogether.

Major George Neumann, a German air expert, said the Germans would keep their aeroplane technicians, but he feared there were obstacles to building large numbers of commercial planes for one or two years.

He said the present restrictions would prevent planes carrying fuel for more than three hours' flight. The only airship the Germans are building is a 45,000 cubic meter Zeppelin, intended to serve in aeronautic study, and to maintain a mail service between Berlin and Stockholm. Germany would gladly build a Zeppelin for America, Major Neumann said, but he regarded the fact that the Americans reduced the specifications to 170,000 cubic meters as a victory for the French, who had sought to block construction of airships by Germany. The construction of this craft for the United States has been begun, but is temporarily impeded on account of the metal workers' strike.

The allied control commission forbade delivery by the Schuette-Lanz company of a rigid dirigible to America. But that firm is evading control in manufacturing parts for eventual assembly in America. Three dirigibles are under construction in this manner for an American firm which intends to operate them between New York and Chicago.

The German air league congress recently was held in Muenster, 120 clubs, with a total of 10,000 members, being represented.—*Aerial Age Weekly*, 29 May, 1922.

AN ECHO OF THE DOGGER BANK.—In the *Marine Rundschau* for April place of honor is given to an article by Commander Gross—author of the North Sea section of the official history of the naval war—on the Dogger Bank action of January 24, 1915. This particular battle has been so often described by writers on both sides that its general character and most of its incidents have become thoroughly familiar to all students of naval

literature. Nevertheless, Commander Gross is able to throw some light on certain phases of the first encounter between capital ships of the dreadnought type. As one who has consistently maintained that the high sea fleet was always anxious for battle, he rather lets the cat out of the bag by quoting Admiral von Ingenohl's official report on the action, from which it appears that the German battle-cruiser sortie was planned on the assumption that the grand fleet, having been sighted near the Bight five days previously, would then be lying at its bases taking in coal, and therefore could not come out in time to intercept the raiders. The object of the cruise, according to von Ingenohl, was to sink suspicious fishing vessels in the neighborhood of the Dogger Bank, and then to push forward towards the British coast in the hope of "mopping up" our light patrols. Von Ingenohl did not add the fact—or perhaps it is purposely omitted from the quotation—that the third item in the programme was a bombardment of the east coast. Be this as it may, he was so confident of non-interference from the grand fleet that he made no provision for supporting Hipper's squadron with the battle-fleet. Dogger Bank cost von Ingenohl his post, which is scarcely surprising in view of the extraordinary lack of foresight which marked the arrangements for the expedition.

Nothing whatever was done to guard against surprise by a superior force. Although three airships lay ready for service at Fühlbuttel and Nordholz, they received no orders to ascend, and the one that did go up at dawn on the twenty-fourth arrived too late to be of any value. Had an airship preceded the squadron it would doubtless have given timely warning of the approach of Beatty's force and thus enabled Hipper to avoid being brought to action.

Another mysterious point which Commander Gross passes over in silence is why the Blücher was included in the squadron. The *Von der Tann* had been severely damaged in a collision resulting from the confusion into which the fleet had been thrown by the Christmas air raid on its anchorage in the Schilling roads, and was therefore not available for the cruise, but it was undoubtedly a blunder of the first magnitude to promote the Blücher to a place in the battle-cruiser squadron, thus reducing its collective speed to 25 knots. The very fact that this comparatively feeble ship took part in the cruise is conclusive evidence that no encounter with strong British forces was anticipated.

Commander Gross asserts that the British admiralty were able to decipher every German W/T signal they intercepted, by means of the code which the Russians had salved from the wreck of the *Magdeburg* in August, 1914, and subsequently placed at the disposal of their Allies. "We were thus playing with all our cards on the table," he adds, "while events on the other side were completely hidden from us." Dealing with the action itself he writes: "It was long believed in Germany that the British opened fire much earlier than we did, but what actually happened was this: At 9.52 A. M. the range was estimated at 200 hectometers (21,800 yards), or approximately the extreme range of the heavy British guns, whereupon *Lion* fired the first sighting shot at *Blücher*. It fell short. At 10 o'clock, soon after the British battle cruisers had taken station with every gun bearing on the target, the *Tiger* began firing single shots to determine the range, but it was not till 10.05 that Beatty gave the general order to open fire. The first salvos fell short by 1,000 to 1,500 metres, and it was not until 10.12 that the *Moltke* reported the first 'overs.' The British had scored no hits by 10.09, at which time Hipper ordered his own ships to open fire. Three minutes later *Lion* got her first hit on the *Blücher*, the shell striking the forecastle between the anchors, but doing no serious damage. At 10.14 *Lion* shifted on to the *Moltke*, while *Tiger* and *Princess Royal* continued to engage *Blücher*. It was only now that the British fire began to take effect." Hits were soon registered by both sides, but the first really

serious one occurred on the *Seydlitz* at 10.43, when a 13.5-inch shell struck the 9-inch armour of the after barbette, and, although failing to penetrate, drove a red-hot splinter inside the trunk, where it ignited a cartridge. Both after barbettes were burned out, and only the prompt flooding of the magazines saved the *Seydlitz* from complete destruction.

According to Commander Gross, the loss of the *Blücher* was primarily due to a peculiarity in her construction. A heavy shell broke through her armour deck at the most vulnerable point, viz., above a special passage in which ran an ammunition tramway for two-thirds the length of the ship, the *Blücher* being the only vessel to have this arrangement. The passage was full of cartridges, which exploded one after another, sending columns of fire up the ammunition hoists into the forward broadside turrets, which were burnt out. As a result of this disastrous hit the entire fire-control system was dislocated, communication throughout the ship broken off, and the steering apparatus deranged, while splinters penetrated the main steam pipe and brought the speed down to 17 knots. Hipper's report explains why the stricken *Blücher* received no help from her consorts. Not only had they been badly mauled themselves—the *Seydlitz* having two turrets knocked out and 600 tons of water in her after part—but it was seen that any attempt to turn back in support of the *Blücher* would expose them to attack by the British destroyers, and in any case the turn could not be made in time to save her from disablement. Moreover, Hipper feared lest another of his ships should sustain damage to the machinery, as he was still 100 miles from home. So the *Blücher* had to be left to her fate.

Summarizing the results of the action, Commander Gross finds that the German battle cruisers, despite their inferior tonnage and weight of broadside, had the best of it in the artillery duel, scoring 20 hits in all and receiving but four in return (*Seydlitz* 2, *Derfflinger* 1, *Blücher* 1), "not counting the numerous hits which the *Blücher* subsequently received at close range." It is to be feared, however, that this is a somewhat partial method of calculation. "There is no doubt," he writes, "that, in spite of this successful result, the effect of the heavy British guns, coupled with the loss of the *Blücher,* the hit on the *Seydlitz,* and the retreat of our squadron, was to create an exaggerated idea of the power of the enemy's weapons, an impression strengthened by our more numerous casualties—954 killed and 80 wounded, against only 14 killed and 30 wounded on the other side. Furthermore, it is a fact that the strategic honors of the day rested with the British. The new system of defending the English east coast appeared to have justified itself. After two unpunished German cruiser raids, the British had succeeded for the first time in intercepting the invaders with superior force and inflicting severe loss upon them." A tribute is paid to the "skillful way" in which this military success was exploited for political ends, especially by Mr. Churchill in his "brilliant" speech on the action in the House of Commons. Commander Gross denies that the morale of the German fleet suffered by reasons of the defeat, but the only evidence he adduces on this point is an extract from an Italian newspaper!—*Naval and Military Record,* 10 May, 1922.

GERMANY'S NAVAL AIRSHIPS AND THEIR WAR RECORD.—The development of the German naval airship service and its work during the war form the subject of an interesting paper by Lieutenant von Schiller in the current number of the *Marine Rundschau,* the German semi-official naval monthly. According to this writer, the dirigible airship as a naval auxiliary was in a very early stage of evolution when the war broke out. It was only after a prolonged study of the performances of Zeppelins in private and army ownership that the navy department decided to order its first airship of this type. Completed in 1913, this vessel, designated the *L-1,* made a few successful flights, but was lost in September of that year in a North Sea

gale. A second ship, the *L-2*, was equally unfortunate, being totally destroyed by a gas explosion on one of her first ascents. Dimensions and other particulars of these two first naval airships are given in the subjoined table. On the outbreak of war, therefore, the German navy had only one airship, the *L-3*, under its control, and as she was detailed to the North Sea station, an old Parseval dirigible was temporarily employed for reconnaissance in the Baltic. The command of the naval airship section (Marine-Luftschiffabteilung) was vested in Captain Peter Strasser, who held this appointment till August, 1918, when he perished in an airship that was shot down in flames by British warships. It seems to be established that he was an officer of outstanding ability, whose technical knowledge, energy, and powers of organisation were largely responsible for the efficient state of the service throughout the war. Shortly after the outbreak of hostilities an agreement was reached with the army command, under which one out of every two new ships completed by the Zeppelin company was to be relinquished to the navy, which also secured control over a number of Schütte-Lanz airships. Measures were at once taken to increase the housing facilities. The first large shed, that at Nordholz, near Cuxhaven, had been hurriedly completed in August, 1914, and new sheds were ordered to be built at Tondern, in Schleswig, Haage, in East Friesland, and Seddin, in Pomerania, each of these stations being protected by an adjacent battery of anti-aircraft guns and searchlights. At the same time a chain of meteorological stations was established along the German coastline, from Ostend, Belgium, to Koenigsberg, in East Prussia. From these stations weather reports were transmitted every three hours by wireless or cable to the headquarters at Wilhelmshaven. Special arrangements had to be made for supplying gas to the various airship depôts, as in most cases the local resources were inadequate for the purpose. This widespread organisation absorbed a very large personnel, and it was no easy matter to find the requisite number of specially trained officers and men. Among the various aerial projects conceived during the war was one of sending up from Flanders an ordinary balloon, which was to drift over London and drop a 2,200-pound bomb on the city. This scheme was abandoned after three fruitless attempts had been made.

It was speedily discovered, states Lieutenant von Schiller, that the type of airship in vogue at the beginning of the war, which was of 22,500 cubic metres capacity, was not sufficiently powerful to perform the arduous duties of war, including long-distance raids. The next type was therefore increased to 32,000 cubic metres, which had already been reached in the first Schütte-Lanz to be acquired by the navy. Even this size proved inadequate, however, and early in 1916 the *L-30*, of 55,000 cubic metres, was built. The difficulty of handling such large vessels on the ground, especially in bad weather, was very great, for which reason it looked as though the limit in dimensions had been reached, and for the next two years the 55,000 cubic metre type continued to represent the standard German airship. Besides the Zeppelin, the only other rigid type that proved equal to the strain of war service was the Schütte-Lanz, and even vessels of that type were unsuited to North Sea work owing to their wooden construction. A few non-rigids were built for coast patrol, and a new type, built on the Gross-Basenach system, was evolved, but its performance is not described.

In the autumn of 1916 the naval airship service began to suffer severe losses in the course of its raids on England, where the anti-aircraft batteries and defending aeroplanes had become both numerous and efficient. One of the first vessels to be shot down was the *L-31*—in October, 1916—whose commander, Mathy, had carried out the first attack on the city of London twelve months previously. In spite of these losses, however, Captain Strasser worked unremittingly to overcome the defence, introducing various modifications which enabled the Zeppelins to rise to much greater alti-

tudes when over enemy territory. By the summer of 1917, attacks were being made from heights so great that the personnel had to be artificially supplied with oxygen. Airships scouting at sea were also compelled to fly very high—eventually at 16,400 feet—in order to avoid attack by enemy seaplanes, and, later on, by aeroplanes flown from the decks of British cruisers.

At the end of 1917 a plan was evolved of conveying to the hard-pressed troops in East Africa a supply of ammunition and medicines by a Zeppelin, the feasibility of the enterprise having been demonstrated by an endurance flight of 105 hours made by the *LZ-120*. An airship of the 55,000 cubic metre class, *L-57*, was selected for the voyage and lengthened by 98½ feet to increase her useful load. This vessel, however, came to grief on her trial trip, and eight weeks elapsed before a new ship, *L-59*, could be made ready. Starting from an emergency base at Jamboli, in Bulgaria, she had got as far as the Dachel oasis on the Upper Nile when a wireless message was received from Berlin, ordering her to return, as news had come of the evacuation of East Africa by the German troops. She returned to Jamboli without mishap, after a round voyage lasting ninety-six hours, the total distance covered being 4,375 miles. This was unquestionably the boldest and most remarkable airship flight of the whole war, and one, moreover, that has not as yet been surpassed. On returning to her base, the *L-59* was partially reconstructed, after which she made a raid on Naples. Her next exploit was to have been a bomb attack on the British naval base at Malta, but while *en route* in the Strait of Otranto she was destroyed in mid-air by an explosion, the cause of which was never ascertained.

Particulars of the German Naval Airship Fleet

Zeppelins

Designation	Capacity	Useful load	Motors	Speed	Ballonets	Date of completion	Maximum ceiling
	Cub. metres.	Kilos.	No. and h.p.	Ft. per sec.			Feet
L-1	22,500	8,600	3 of 160	69	18	1912	—
L-2	27,000	11,000	3 of 160	68.9	18	1913	—
L-3 to *8*	22,500	8,700	3 of 180	70	18	1914–15	8,200
L-9	25,000	10,000	3 of 210	72.2	15	1915	9,842
L-10 to *19*	32,000	15,600	4 of 210	82	16	1915	10,500
L-20 to *25*	35,800	17,800	4 of 240	82	18	1915–16	11,480
L-30 to *42*	55,000	30,000	6 of 240	91.9	19	1916	13.123
L-43 to *52*	55,800	39,000	5 of 260	96.5	18	1917	18,044
L-53 to *65*	56,000	40,000	5 of 260	100	14	1917–18	19,684 to 21,324
L-57, *L-59*	68,500	52,000	5 of 260	91.9	16	1917	22,470
L-70	62,200	47,000	7 of 260	105	15	1918	21,980
L-71, *L-72*	62,200	49,000	6 of 260	105	15	1918	22.960

Schütte-Lanz

SL-3, 4	32,400	13,400	4 of 210	78.7	15	1914–15	8,857
SL-6, 8, 9	35,000	16,000	4 of 210	85.3	16	1915–16	11,480
SL-12, 14	38,700	20,000	4 of 240	85.3	17	1916–17	12,138
SL-20, 22	56,000	35,500	5 of 260	95.15	16	1917–18	14,763

NOTE.—In addition, there were four Parseval airships and one of a special type. *M-4*.

Performances and Losses During the War

Year	No. of airships in service			Scouting trips	Raids	Losses caused by—				Placed out of commission
	Simultaneously		Total during year			Enemy action	Bad weather	Explosion	Total	
	Max.	Min.								
1914..........	4	1	6	59	—	—	—	—	—	1
1915..........	15	5	22	389	30	4	4	2	10	1
1916..........	19	14	31	296	107	8	4	4	16	1
1917..........	19	11	39	281	46	9	5	—	14	9
1918..........	11	7	23	123	17	5	1	6	12	3
	—	—	—	1,148	200	26	14	12	52	15

During 1914 and 1915 the airships *Viktoria Luise* and *Sachsen*, used for training purposes, were employed for short-range scouting duty, but were placed out of commission in 1915.

The total number of airships employed during the war were as follows: 65 Zeppelins, 9 Schütte-Lanz, 3 Parsevals, 1-M type. Of this number, 72 were available for scouting duty and raids, the others being detailed for training purposes. Each of these 72 ships made an average of 16 scouting trips and 3 raids. In the Baltic, 24 airships made 220 scouting trips and 41 raids. In the North Sea, 70 ships made 928 scouting trips and 159 raids.

Of the airships lost, 19 were destroyed with all hands; the crews of 6 were taken prisoner, and the crews of 3 were interned in neutral countries. Twenty-four airships were destroyed without loss of personnel.

From beginning to end, the German naval airship fleet had sixteen stations with shed accommodation under its control, including the emergency station at Jamboli in Bulgaria. The principal station was at Nordholz, near Cuxhaven, where eventually there was accommodation for six ships of the largest type and two smaller vessels.

In addition to casualties from enemy action, heavy losses were suffered through bad weather and accident. There had already been several cases of individual ships having been destroyed in their sheds by fire, but in January, 1918, five of the very latest vessels were simultaneously destroyed by an explosion at the Ahlhorn depôt. By 1918 it was recognised that the war value of the Zeppelin had sensibly declined. Aeroplanes, in conjunction with "an excellently organised artillery," had rendered airship raids on England too hazardous to be attempted, except on rare occasions when the weather was particularly auspicious. At the same time airship reconnaissance over the North Sea had become exceedingly dangerous by reason of the speedy and fast-climbing aeroplanes carried on British warships. These machines not only brought down a number of scouting Zeppelins, but even attacked the latter in their own sheds, two being destroyed in this way at Tondern in July, 1918. In the vain hope of circumventing British gunners and aviators, Captain Strasser designed a new type, beginning with *L-70*, which was fitted with seven motors and had a maximum ceiling of 23,000 feet. On August 6, 1918, this giant craft set out to raid England, those on board including Captain Strasser himself, who had insisted on making the expedition in spite of the remonstrances of his brother officers. While over the North Sea in bright moonlight the *L-70* was sighted by British warships and promptly shot down in flames with the loss of all hands, the atmospheric conditions having been such that she could not maintain her maximum altitude. The death of Captain Strasser made profound impression in Germany, which was intensified when, five days later, the *L-53*, commanded by Captain Prolss, another of the ablest officers in the service, was destroyed in the North Sea, this time by an aeroplane. These successive disasters appear to have caused a reaction against the Zeppelin, for all further raids and reconnaissances were forbidden, pending the completion of a new type, which it was hoped would prove less vulnerable. This vessel had a capacity of 62,000 cubic metres,

but before she was ready the German cause collapsed, and airship development was forthwith arrested.

The principal war duties assigned to the German naval airships were, according to Lieutenant von Schiller, as follows:

(1) Daylight reconnaissance of a general nature in the Baltic, North Sea, Skagerrack, and Cattegat, and often as far as the British coast; in the summer months, night scouting.

(2) Scouting in advance when sorties by the fleet or special naval enterprises were contemplated.

(3) Screening the battle fleet at sea and giving escort to incoming or outgoing auxiliary cruisers.

(4) Protecting the mine-sweeping flotillas and occasionally searching for mines themselves.

(5) Making attacks against England and Russia.

In reviewing the Zeppelin raids on England, Lieutenant von Schiller argues that they were justified not only by the material and moral damage inflicted on the enemy, but also by the fact that the Zeppelin menace compelled England to retain at home a large number of guns, aeroplanes, and men whose weight would otherwise have been felt on the western front. When the revolution occurred the German navy had only seven effective airships left, and these were intentionally destroyed in their sheds on July 19, 1919, the day on which the high sea fleet scuttled in Scapa Flow.—*The Engineer,* 12 May, 1922.

GERMANY'S ONLY SCHOOL SHIP.—Under the terms of the Versailles Peace Treaty all of the training ships belonging to the German merchant marine had to be surrendered to the Allies with the exception of the *Grosherzogin Elisabeth,* a steel sailing vessel of 1,260 tons, built in 1901, and belonging to the German School Ship Society. During the last twenty years 2,542 officers for the German merchant marine have been graduated from this ship.

The vessel has accommodation for 167 cadets and made a cruise last fall to the West Indies. On her voyages she carries cargo in order to reduce expenses and to give those on board an opportunity of learning how to load and discharge freight.—*Nautical Gazette,* 13 May, 1922.

GREAT BRITAIN

THE NEW BATTLESHIPS.—Sir Percy Scott appears to have been misinformed on the subject of battleship construction. In a letter to the *Times* he stated that he had heard privately that the date of beginning the two new battleships had not been settled and that this meant that they were not to be built at all. On the contrary, we learn that the plans of the ships are in such a forward condition that it is fully expected the contractors will be asked to tender for their construction early in June. It should be noticed also that in the detailed naval estimates just issued the total expenditure on these two ships to March 31 of next year, excluding their armament and ordnance stores, is rather over a quarter of a million sterling. This indicates, as the ships are to be smaller than the four originally ordered and will probably not exceed 35,000 tons displacement each, that a fair amount of material will be worked up before the end of the financial year. Doubtless the same firms which competed for the four ships will compete for these two, but whether, as in that case, the contracts go to the Clyde and the Tyne must remain uncertain for the present.—*Army, Navy, and Air Force Gazette,* 30 May, 1922.

NEW BATTLESHIP PLANS.—It is doubtful whether our constructors have ever been faced with a task so formidable as the design of these two new vessels. The pre-war capital ship was already approaching the 30,000-ton limit, and even then it was no easy matter to embody the speed, armament, and protection which naval opinion insisted upon. Now, however, there is a demand for much heavier protection above and below the waterline, together with a stronger armament, and the percentage of weight allotted to these two factors has increased enormously. What Sir E. T. d'Eyncourt and his staff are now called upon to do is to design a ship able to resist 16-inch projectiles, including those which, having been discharged at very long range, are liable to fall at a steep angle; so well protected beneath the waterline as to be capable of withstanding several blows from torpedoes or bombs of the largest size, and with decks sufficiently strong to defeat attack by heavy charges of high explosives dropped from the air; to mount an armament not inferior in weight of numbers to that of any foreign capital ship now afloat; to possess a speed well up to the average of foreign battleships; and withal to displace, when completed, no more than 35,000 tons.

The problem at first sight seems almost impossible of solution, but our constructors have already given so many instances of their skill that we do not doubt their ability to produce a satisfactory design in this case also. Obviously, however, the drafting of plans for ships of so novel a character must be a lengthy business, occupying far more time than would be needed were it merely a question of modifying some type already in existence. Even if the designers got to work immediately after the Washington decisions became known, it is doubtful whether the first complete drawings could be finished in less than six months, and their preparation may, in fact, take a good deal longer than that.

Owing to repeated modifications, it is said, the plans of the four super-*Hoods* took nearly eighteen months to finish, and the design of those ships can scarcely have presented so much difficulty as that of the two "Conference" battleships. If, therefore, their keels are laid early next year, the admiralty constructors will have performed some very smart work. In any case, the delay will not be so great as to involve that "irrevocable loss of time and building facilities which might make it impossible to maintain our sea security if it should be threatened," to quote the prime minister's words last July, when he was explaining the need for the battle-cruiser programme that was subsequently dropped as a result of the Limitation Treaty.—*Naval and Military Record,* 17 May, 1922.

FISHERY PROTECTION.—The Bolshevists, through their so-called trade delegation, are understood to be complaining because the British Government have despatched a warship into northern Russian waters for the protection of the British fishermen and their vessels. The Soviet Government have threatened, it is reported, to send armed vessels to enforce the rights which they claim to assert over a twelve-mile limit. The situation has a disagreeable aspect, for in the first place the British navy is represented by the little *Harebell,* a sloop carrying two 4-inch and two 12-pounders as her armament; while if the Russians carry out their threat they have the power to put a much stronger force in those seas. Moreover, it is believed that their vessels are commanded by German naval officers, some of whom may have been submarine captains in the late war. As to the legality of the Bolshevists' decree of May 24, 1921, prohibiting foreign fishing within twelve miles of their coast, our Government has already protested against it. So far, however, the Russians have ignored the British protests and are apparently prepared to support their breach of international law by further offensive action. Doubtless the German officers in Russian employ

will be quite ready to put fire to the fuel, and in the circumstances it is somewhat surprising that a stronger force was not sent to the scene of possible action.—*Army, Navy, and Air Force Gazette,* 19 April, 1922.

COM. BURNEY'S AIR SCHEME.—The air ministry last week made a tentative suggestion to the treasury to ascertain whether any support can be given by the state to Commander Burney's scheme for using British airships. The treasury is unable to consider any of the proposals if they involve lending large sums of money. Consequently government aid to Commander Burney and the important syndicate for which he speaks now appears to be impossible, and the air ministry does not expect that anything will come of the scheme.—*Naval and Military Record,* 16 May, 1922.

WARSHIPS' CABLES.—The attention of officers in command of fleets and squadrons is called by the admiralty in a lengthy order issued on Friday to the immense strain brought on cables anchoring heavy ships with much way on. The parting of chain cable in H. M. ships is mainly due to the gradual weakening of the cables, consequent on the excessive strain to which they are subjected when mooring, and more care in the manipulation of the cables would increase their "life" and reduce the possibilities of accident through parting.

The lengths of cable which part are generally those amongst the first six shackles, which include the shackles used for hauling round the bows. Mooring ship, however carefully carried out, is liable to strain the cable, and heavy strains are from time to time brought on the cables in the desire to avoid veering unnecessarily on the first anchor, and also in the use of slack shackles for hauling round the bows. These strains gradually distort and weaken the links, but so long as the cable does not part they are ignored. When eventually parting takes place without any immediate cause assignable, the accident is attributed to defective material or unsuitable size of cable, but in such circumstances it is improbable that an increase in the size of cable would prevent the best material from parting.

The efficiency of ships' cables is of such supreme importance that rapidity in mooring should give place to a method in which the strain on the cables is reduced to a minimum.—*Naval and Military Record,* 10 May, 1922.

VALUE OF SMALL HIGH-SPEED TORPEDO VESSELS.—Whatever may be the ultimate decision as to the employment of light craft in naval warfare of the future, there can be little doubt that the class of small high-speed torpedo vessels propelled by internal-combustion engines, and known as coastal motor boats (or more familiarly as C. M. B.s), will play an even more important part than they did in the last war, says *Engineering.*

The form of hull employed in these vessels, which are of the skimming type, was developed by model experiments carried out by Sir John I. Thornycroft over a period of ten years or so prior to the war, the object being to produce a form having a very low resistance combined with good seagoing qualities. Tank experiments alone were not sufficient to determine the best proportions and form, and actual boats which were built and tried at sea by Sir John's son, Mr. Tom Thornycroft, played an important part in the developments.

The boats of this class constructed before the war, however, were only employed for racing and experimental purposes, carrying not more than two or three men, and just sufficient fuel for the completion of a race. Considerable modification was therefore necessary to render them suitable for carrying one or two torpedoes, each weighing about 15 cwt., as well as the fuel supply necessary to give a useful radius of action, the crew of

three or four men required to work the boat under war conditions, and the discharging gear for the torpedoes.

At the period of the war when Admiral Sir Henry Jackson was first sea lord, it was decided that motor torpedo boats should be built, and Messrs. John I. Thornycroft and Co., Ltd., were given instructions to build as quickly as possible twelve experimental boats of the special form of hull to which reference has been made. Further experiments were carried out, and the designs prepared for 40-feet and 55-feet boats, of which a large number was eventually built by Messrs. Thornycroft themselves and several other firms acting as their sub-contractors from 1915 to 1918.

A full account of the exploits of these vessels would form extremely interesting reading, but the utmost secrecy was naturally observed regarding their construction and employment during the war, so that, for a considerable period the general public was quite unaware of their existence. Very little has been published on the subject since the conclusion of hostilities, but it is now known that the vessels were first employed in the winter of 1916-17 at Dunkirk, from which base they were frequently in action with German patrol boats and destroyers. For work in the North Sea they were based at Harwich, and, armed with depth charges, as well as with torpedoes, were effectively employed in countering the submarine menace.

They were also used for laying mines in positions which were inaccessible to ordinary mine-laying craft. More striking, however, was their work in connection with the blocking actions at Zeebrugge and Ostend in 1918, and, after the armistice, in the attack on Kronstadt. It will be remembered that the Russian cruiser *Oleg* was first torpedoed by a coastal motor boat outside Kronstadt Harbor and that afterwards several Russian vessels were destroyed in the harbor itself in an action that was unique in naval history.

That the possibilities of coastal motor boats are now being considered by other naval powers may be gathered from the fact that Messrs. Thornycroft have received orders for them from the French, American, Japanese, and other Governments.—*Engineering.*

SURPLUS NAVAL OFFICER.—In a fleet order, issued on Friday, May 12, the following special retirement terms are those offered to executive officers. The approximate number of surplus officers is as follows:

	Executive Officers	Engineer Officers	Accountant Officers	Royal Marines
Captains	119	—	—	5 Lieut. Cols., R. M.
Commanders	200	84	26	14 Majors, R.M.
Lieut. Commanders	—	—	18	A few Captains and Lieuts., R.M.
Lieuts., ex-Cadets	407 (under 4 years)	—	31	
Lieuts., ex-Mates	139	—	—	—
Lieuts., ex-Warrant Officers (Special)	44	23	—	28 Captains and Lieuts., R.M. (promoted from ranks)
Sub-Lieuts	46	—	—	—
Commissioned and Warrant Officers	474	138	26	13
Total	1,429	245	101	60

Grand Total—1,835

Terms Open for Six Months

The special terms of retirement will be open for a maximum period of six months from May 12, 1922.

Captains, R. N.

Captains of six years' seniority and above on August 12, 1922, who, on the date of retirement, have the qualifying service for promotion laid down in Article 263, King's Regulations and Admiralty Instructions, to receive retired pay at the rate of £800 per annum for twenty-one years' service counting towards retired pay, with an addition or reduction of £15 per annum (limited to five years) for each complete year in excess of or short of the standard on August 12, 1922. Captains of three years' seniority and above on August 12, 1922, including captains of six years' seniority and above, who have not, at the date of retirement, the qualifying service for promotion, to receive retired pay at the rate of £700 per annum for eighteen years' service counting for retired pay, with an addition or reduction of £15 per annum (limited to five years) for each complete year in excess of or short of the standard on August 12, 1922. Officers retired with the foregoing special rates of retired pay to be eligible to rise by seniority to the rank of rear admiral on the retired list, provided that, at the date of retirement, they have had three years' service as captain in command of a ship of war at sea. Captains under three years' seniority on August 12, 1922, to receive the rate of retired pay for which they are eligible under the regulations if they retired on that date, with an addition of £100 per annum to retired pay.

The alternative for officers selected for retirement will be: To be placed on half-pay (if not already on half-pay) and to be retired for non-service, on the expiration of two years from their last date of "service," or three years from date of promotion to captain, if later, with the rate of retired pay laid down under existing regulations. Officers choosing this alternative will be promoted to the rank of rear admiral on the retired list, only if before retirement they had completed the full qualifying service for promotion laid down in Article 263, King's Regulations and Admiralty Instructions.

Commanders, R. N.

The following special terms are offered to commanders who by age and service have qualified or will have qualified by August 12, 1922, for the maximum rate of retired pay of their rank, and commanders of seniorities 1915 to 1919 inclusive. Commanders who have qualified or will have qualified under the ordinary regulations for the maximum rate of retired pay of their rank on August 12, 1922, will be eligible to receive, in addition to this rate of retired pay, a gratuity of £250 for each complete year by which they are short of fifty years of age on the day previous to the day of commencing retired pay, with an addition of £62 10s. for each complete three months of an uncompleted year, subject to a maximum gratuity of £750 not being exceeded in each case. Time for these gratuities will be reckoned as laid down in K. R., 6 of October, 1921. Commanders of seniorities 1915 to 1919 inclusive will be given the rate of retired pay to which they would be entitled under existing regulations (*vide* p. 2264A of the *Quarterly Navy List*) if they retired on August 12, 1922, together with an addition of £100 per annum, subject to a total maximum of £600 per annum not being exceeded. Gratuities will not be paid in addition.

The alternative for officers selected for retirement will be: To be placed on unemployed or half-pay (if not already on unemployed or half-pay) in accordance with the ordinary regulations, and to be retired for

non-service on the expiration of two years from their last date of "service," with the rate of retired pay laid down in the regulations.

Lieutenants, ex-Cadets

The following special terms shall be open to lieutenants ex-cadet of seniorities 1918 and later:

Seniority on August 12, 1922	Retired pay per annum
Less than 1 year	£ 82 10
1 year, but less than 2 years	£ 90 0
2 years, but less than 3 years	£ 97 10
3 years, but less than 4 years	£105 0
4 years, but less than 5 years	£112 10

(Plus a sum of £350, with a gratuity in addition reckoned as follows from the date of first joining a seagoing ship to August 12: For each of the first three complete years, £50; for each complete year subsequently, £100; for each complete three months of an uncompleted year, £12 10s. or £25, according to whether the period of service is under or over three years. Time for these gratuities will be reckoned as laid down in K. R. 6, of October, 1921 (Explanation of Terms). Acting lieutenants to be eligible for these rates on the basis of their acting seniority.

The alternative for officers selected for retirement will be: To be placed on unemployed or half-pay (if not already on unemployed or half-pay) and receiving unemployed pay for the first six months from original date of ceasing employment or full pay leave, at the rate of the full pay of their rank and seniority (without allowances); for the next six months 17s. a day, and for a further period of two years, half-pay at half the full pay of their rank and seniority. As soon as three years have elapsed since their last "service" they will be placed on the retired list for non-service with retired pay at the following rates per annum:

Less than 1 year's service as lieutenant	£ 75 0
1 year, but less than 2 years as lieutenant	£ 82 10
2 years, but less than 3 years as lieutenant	£ 90 0
3 years, but less than 4 years as lieutenant	£ 97 10
4 years, but less than 5 years as lieutenant	£105 0
5 years, but less than 6 years as lieutenant	£112 10

For the purpose of retired pay, service on full pay counts in full, but service on unemployed pay (either at the full pay rate or the intermediate rate), and service on half-pay counts as one-third.

SUB-LIEUTENANTS, MIDSHIPMEN, AND CADETS

The sub-lieutenants', midshipmen's, and naval cadets' lists, taken as a whole, are not materially overborne, provided that the proper proportion of sub-lieutenants and midshipmen volunteer for engineering, in which branch the prospects of junior officers are at the present time much brighter than in the executive branch. A certain number of sub-lieutenants, other than those who have volunteered for (E), will be allowed to retire with a gratuity of £500. Should the number of sub-lieutenants retiring voluntarily be insufficient, it may be necessary to select some officers for retirement. No reductions are contemplated in the case of midshipmen and cadets other than those already approved for the term passing out of Dartmouth in August, 1922.

GENERAL

The admiralty desire to state emphatically that the fact that an officer is selected for retirement under this scheme in no way constitutes any reflection upon his character, conduct, or ability during his naval service. All officers retired under these schemes are liable for service, if required, in the event of war or emergency. The admiralty reserve the right to close the scheme at any time without previous notice, either generally or in respect of any particular rank or seniority, as soon as the necessary reductions have been effected. They also reserve the right of withholding permission from any officer to retire under the scheme, and they may direct that any officer, during the time the scheme is open, is to be retired under any other regulations which are applicable to his case. (E) officers and officers specializing in (E) are excluded from this scheme. Twenty per cent of all rates of retired pay granted under these schemes is to be considered as due to the high cost of living, and as these rates are based upon the ordinary rates fixed in 1919 with regard to the cost of living at that date they will similarly and to the same extent be subject to revision either upwards or downwards on July 1, 1924, and subsequently.—*Army, Navy, and Air Force Gazette*, 20 May, 1922.

THE AMERICAN NAVAL PERSONNEL.—It is not entirely clear even now to what numbers the personnel of the United States navy will be limited. The bill as originally placed before the House of Representatives provided for 67,000 enlisted men, whereas the department of the navy considered that at least 96,000 were necessary. An amendment to this effect was proposed by Mr. Rogers. A further amendment, increasing the number in the bill to 86,000, 80,000 enlisted men and 6,000 apprentices, was proposed by Mr. McArthur, the representative of Oregon. This amendment was accepted by a record vote of 221 against 148. In the course of the discussion it was stated that the personnel of the British navy would be by March of next year 117,758, after the proposed reductions. There is an error here, for by March of next year the personnel of the British navy is to be reduced to 97,000, as is shown in the estimates and by Lord Lee's memorandum. If also all the naval personnel of the United States is counted in, the total works out at considerably more than 86,000. Not until we have the exact figures showing, in addition to the number of officers and enlisted men, the other groups administered by the navy department, can we draw any comparison of value with the numbers of our own personnel. Meantime attempts are being made in America to demonstrate that the British and Japanese navies are to be supplied proportionately with thirty per cent more men than is allowed to the United States fleet. The fact is that while we are cutting down our lists of officers the Americans are aiming to maintain their commissioned list, as Mr. Denby contended must be the case, especially as regards the executive officers. "If I have to cut the commissioned list," he said, "the line or civil officer must go, for they can be replaced more easily in war time." It would be of advantage if the facts about the personnel of the three navies were explained by question and answer in Parliament.—*Army, Navy, and Air Force Gazette*, 13 May, 1922.

NO BRITISH DRY-DOCK FOR THE "MAJESTIC."—Negotiations for the purchase of a large dry-dock from the Port of Hamburg having broken down, Viscount Devonport at a luncheon on the White Star liner *Majestic* at Southampton stated that there was no single dry-dock in the United Kingdom where the *Majestic* could be docked. He regretted that most exceedingly, because the Port of London authority had recently opened a dock which, had it not been for adverse circumstances, would certainly

have been big enough for any ship in the world. Thanks to the enterprise of the London and South Western railway, however, all difficulties have been overcome. It seems that the railway undertaking, with that characteristic spirit which has been responsible for raising Southampton to the position of the premier British port for the largest and fastest mail steamer, has entered into provisional agreement whereby an adequate floating dry-dock will be provided within the next twelve months. This is enterprise indeed, and shows that the southern port will leave no stone unturned to maintain the laurels it has so deservedly won.—*Nautical Gazette*, 27 May, 1922.

JAPAN

JAPAN'S SHIPBUILDING POLICY.—Further particulars of the Japanese naval shipbuilding programme which have recently come to hand confirm the statement previously made in these columns to the effect that the Limitation Treaty negotiated at Washington has not resulted in that complete cessation of warship building which the authors of the conference were desirous of bringing about. Japan, it is true, has cancelled the whole of her uncompleted capital ships and thus fulfilled her treaty obligations to the letter, but at the same time she has found it necessary in the interests of national defence, and perhaps still more for economic reasons, to put in hand a considerable number of new vessels representing types which are outside the scope of the treaty. A Japanese correspondent who is in a position to speak with authority assures me that had the Government attempted to fulfill not merely the letter of the Disarmament Treaty, but its spirit also, a domestic crisis of the utmost gravity would have been precipitated thereby.

"It is not too much to say," he writes, "that the annulment of all outstanding naval contracts would have swamped us in a sea of industrial troubles that might have culminated in revolution. The Government was faced on the one hand with the claims of those many thousands of people, including some of the most influential in the country, whose capital is locked up in shipbuilding enterprises which are at this moment almost entirely dependent on naval orders for their subsistence, and on the other hand by the demand of 100,000 work people employed in shipbuilding, engineering, and marine equipment trades that no action likely to imperil their livelihood should be taken. It is most necessary that the dilemma in which our Government was placed should be understood abroad, since otherwise its action in continuing to order warships of the smaller types may be misconstrued. It is a mistake to suppose that the military party is urging the Government to expand its naval armaments regardless of the Limitation Treaty. The truth is that the militarists are more anxious to improve the fighting equipment of the army, and they think that the money saved on battleships should be spent for this purpose. If a considerable number of orders for cruisers, submarines, etc., have been placed during the past few months, it has simply been to save the shipyards from closing their doors, and thus throwing many thousands of workmen out of employment at a time when Bolshevist agitators are trying hard to stampede Japanese labor in the direction of revolution.

My correspondent adds that in all probability the ships recently ordered will be constructed very slowly, with the object of spreading the work over as long a period as possible. Although the actual dates on which the contracts were awarded are uncertain, it is understood that at least ten light cruisers have been contracted for within the past six months, all of which, it is important to note, have been authorized under the 1920 programme, though in the normal course of events their construction would

not have begun so soon. There are at present on the stocks or about to be laid down the following ten light cruisers: *Minase, Otonase, Ayase, Jintsu, Sendai, Naka, Kako, Abukuma, Yubari, Kinu,* while three similar vessels, *Yura, Natori,* and *Isudzu,* are completing afloat. Authentic particulars of these ships are not yet available, but there is reason to believe that they average 6,000 tons in displacement, are designed for a speed of 33 knots, and carry seven 5.5-inch or 6-inch guns. Destroyers to the number of at least 30 are building or shortly to be laid down, the majority being very large and fast boats, the remainder with displacements of less than 1,000 tons. Strict reticence is maintained by the Japanese authorities regarding the number and type of submarines actually building, but it seems certain that not less than 30 of these craft are now in hand and that orders for a further ten have been placed. Unless, however, recourse is had to foreign manufacturers, the execution of the submarine programme will probably be a very slow business, for it is doubtful whether Japanese industry is in a position to build a large number of the powerful motors required for the latest type of Japanese ocean-going submersible, which is a vessel of large dimensions and high speed.

It will be interesting to observe the effect of this post-conference shipbuilding activity in Japan on the naval policy of the United States. By the time that the ten new American light cruisers are completed Japan will have at least twice that number of similar ships in commission, besides a submarine flotilla which in numbers and fighting power will compare very favorably with the American establishment. The general board of the United States navy is known to be strongly advocating an immediate extension of the light-cruiser programme, but thus far no new construction has been authorized.—*Naval and Military Record.*

NOTES FROM JAPAN.—Upon his return from Washington, where he had acted as chief Japanese delegate to the conference, Admiral Baron Kato, minister of the navy, gave the Imperial Diet some further details of the negotiations which had preceded the signing of the naval treaty, and dealt with certain criticisms raised by the various members. With regard to the question of Pacific fortifications, one member argued that if these were to be limited at all such limitation should cover the whole of the Pacific. Hawaii, however, being a great distance from the American continent, was excluded from the scope of the agreement, while the Bonins and Amami Oshima, which no one had any doubt of being part of Japan proper, were included. This was criticized by the speaker as a one-sided arrangement. In reply Admiral Kato said that he took a different view of the fortification question. The Philippines had undoubtedly been a menace to Japan, who was therefore particularly desirous that the fortification of those islands should be limited, seeing that they were the only point where a powerful naval base, such as would constitute a serious danger to Japan, could be created. As for the Bonins and the Amami Oshima, they could never be made into powerful naval bases, even if forts were built there. As Japan was so anxious that the fortification of the Philippines should not be extended, he considered it would have been very disadvantageous if his insistence of the inclusion of Hawaii had resulted in the defeat of the entire proposal, and he had therefore deemed it the wisest policy to make concessions on the question of Hawaii.

Interpellated as to the intentions of the Government with regard to the future programme of cruisers, destroyers, and submarines, Admiral Kato declared that there was no intention of enlarging this programme, though alterations might be made in the size and type of the vessels concerned, a remark which applied to submarines as well as to surface craft.

A lieutenant of the Japanese navy was court-martialed at Yokosuka last month on a charge of attempted fraud, and sentenced to one year's penal servitude and dismissal from the service. He had endeavored some time ago to sell various "naval secrets" to the American Embassy, which at once communicated with the Japanese police. Investigation showed that the documents which he had offered to Captain Watson, the naval attaché to the Embassy, contained no information that was really confidential and had probably been "faked" by him. This is believed to be the first case in which an officer of the Japanese navy has been convicted of a crime involving treason, though even in this instance it is clear that the culprit had no real intention of divulging official secrets. The action of the American embassy in so promptly notifying the Japanese authorities of the plot is said to have made an excellent impression in Tokio.—*Naval and Military Record*, 13 May, 1922.

JAPANESE SEAMEN'S WAGES.—According to testimony given at the hearings of the pending ship subsidy bill Japanese seamen's wages in the trans-Pacific trade are as follows: There are four grades of able seamen with wages ranging from 49 to 58 yen, two grades of firemen receiving 58 to 59 yen and two grades of coal passers paid at the rate of 50 and 52 yen. A yen is worth about fifty cents.—*Nautical Gazette*, 27 May, 1922.

OSAKA SHOSEN KAISHA.—The annual report of the Osaka Shosen Kaisha company shows that the company's gross earnings in 1921 totaled 59,335,075 yen as against 89,716,444 yen in 1920. Last year's receipts were derived from the following sources of income:

	Per cent
Freights	72.8
Passenger Fares	16.3
Miscellaneous Receipts	7.3
Subsidies	3.6

Net earnings last year were only 2,029,742 yen as compared with 11,052,890 yen in 1920. At the close of the year the company's fleet consisted of 133 vessels of 414,149 gross tons valued at 68,728,912 yen or at the rate of 165.95 yen per ton. The amount spent on repairs last year was 3,231,992 yen or 4.7 per cent of the book value of the steamer fleet. The company is conducting 48 regular services and last year carried 1,731,790 passengers.

While the results for last year were disappointing, the directors report that the net earnings in the second half of last year were 1,762,379 yen greater than in the first half. The better showing was due to a reduction in working expenses and not to an improvement in business.—*Nautical Gazette*, 5 June, 1922.

UNITED STATES

NAVY DEPARTMENT, BUREAU OF CONSTRUCTION AND REPAIR, WASHINGTON, D. C.

May 10, 1922

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of April 30, 1922

Type Number and Name	Contractor	Per cent of Completion: May 1, 1922 Total	May 1, 1922 On Ship	April 1, 1922 Total	April 1, 1922 On Ship	Contract date of Completion	Probable date of Completion
	BATTLESHIPS (BB)						
45 *Colorado*	New York S. B. Cpn.	91.7	91.2	90.7	90.		Indefinite
47 *Washington*	New York S. B. Cpn.	75.9	70.3	75.9	70.3		Indefinite
48 *West Virginia*	Newport News S. B. & D. D. Co.	80.	78.3	78.	76.		Indefinite
49 *South Dakota*	New York Navy Yd.	38.5	31.6	38.5	31.6		Indefinite
50 *Indiana*	New York Navy Yd.	34.7	27.2	34.7	27.2		Indefinite
51 *Montana*	Mare Island Navy Yd.	27.6	19.	27.6	19.		Indefinite
52 *North Carolina*	Norfolk Navy Yd.	36.7	27.1	36.7	27.1		Indefinite
53 *Iowa*	Newport News S. B. & D. D. Co.	31.8	27.4	31.8	27.4	7/12/23	Indefinite
54 *Massachusetts*	Beth. S. B. Cpn. (Fore River)	11.	4.3	11.	4.3	7/12/23	Indefinite
	BATTLE CRUISERS (CC)						
1 *Lexington*	Beth. S. B. Cpn. (Fore River)	33.8	24.2	33.8	24.2		Indefinite
2 *Constellation*	Newport News S. B. & D. D. Co.	22.7	19.5	22.7	19.5		Indefinite
3 *Saratoga*	New York S. B. Cpn.	35.4	28.	35.4	28.		Indefinite
4 *Ranger*	Newport News S. B. & D. D. Co.	4.	1.5	4.	1.5		Indefinite
5 *Constitution*	Philadelphia Navy Yd.	13.4	8.4	13.4	8.4		Indefinite
6 *United States*	Philadelphia Navy Yd.	12.1	7.1	12.1	7.1		Indefinite
	SCOUT CRUISERS (LIGHT CRUISERS) (CL)						
4 *Omaha*	Todd D. D. & Const. Cpn.	99.2	94.8	99.2	94.8	8/1/21	Indefinite
5 *Milwaukee*	Todd D. D. & Const. Cpn.	95.	90.	94.9	87.9	12/1/21	Indefinite
6 *Cincinnati*	Todd D. D. & Const. Cpn.	88.2	82.5	88.2	82.	7/1/22	Indefinite
7 *Raleigh*	Beth. S. B. Cpn. (Fore River)	65.9	49.1	64.9	47.6	8/1/21	Indefinite
8 *Detroit*	Beth. S. B. Cpn. (Fore River)	84.7	74.2	82.8	70.8	11/1/21	Indefinite
9 *Richmond*	Wm. Cramp & Sons Co.	90.7	83.5	89.	82.		9/15/22
10 *Concord*	Wm. Cramp & Sons Co.	85.5	78.	85.	78.		12/1/22
11 *Trenton*	Wm. Cramp & Sons Co.	59.	47.	59.	47.	10/1/21	6/1/23
12 *Marblehead*	Wm. Cramp & Sons Co.	47.	33.	47.	33.	1/1/22	10/1/23
13 *Memphis*	Wm. Cramp & Sons Co.	40.	26.	40.	26.	4/1/22	8/1/23
	AUXILIARIES						
Repair Ship No. 1, *Medusa* (AR1)	Puget Sd. Navy Yd.	80.8	71.3	79.3	70.8		Indefinite
Dest. Tender No. 3, *Dobbin* (AD3)	Phila. Navy Yd.	71.1	70.8	69.9	69.6		Indefinite
Dest. Tender No. 4, *Whitney* (AD4)	Boston Navy Yd.	52.8	46.5	51.8	45.1		Indefinite
Sub. Tender No. 3, *Holland* (AS3)	Puget Sd. Navy Yd.	21.5	5.5	21.5	5.5		Indefinite
	PATROL VESSELS						
Gunboat No. 22, *Tulsa* (PG22)	Charleston Navy Yd.	73.3	62.5	72.7	61.3		Indefinite
	DESTROYERS						
*339 *Trever*	Mare Island Navy Yd.	99.8	99.8	99.8	99.8		
340 *Perry*	Mare Island Navy Yd.	98.	98.	95.2	95.2		6/5/22
341 *Decatur*	Mare Island Navy Yd.	88.1	88.1	86.1	86.		7/5/22

Destroyers authorized but not under construction or contract.
(12) Nos. 348 to 359 inclusive.
*Ready for commissioning.

There are three fleet submarines and thirty-eight submarines under construction.

There are six fleet submarines and one submarine authorized but not under construction or contract.

Submarine "S-51" Completes Its Test.—The official report to the navy department of the successful completion on Long Island Sound of a 52-hour continuous running test of the submarine *S-51* adds a second modern submersible of this type to the American submarine flotilla. It is one of four of this class under construction for the navy by the Lake Torpedo Company, of Bridgeport, Conn., all of which will soon be commissioned in active service. The *S-51* is 248 feet long.

The *S-51* is a double hull navy-designed boat with many new features that are not found in the other S-class boats. The plan on which she was built contains the most meritorious and effective features of German U-boat construction. One of the most notable new features is the method of opening valves to submerging tanks which makes possible quick drives by the boat. During the trials it was found possible to drop it under water in less than a minute.

Submarines of this type are equipped with four 21-inch torpedo tubes in the bow and one in the aft. They carry a four-inch gun in "wet mount" on the forward deck and afford greater comfort to the crew than previous types. The arrangement of the submerging valves controls lead to a central pneumatic manifold, where the turn of a single lever opens all Kingston valves simultaneously, permitting between 300 and 400 tons of water to flow into the diving tanks in less than 60 seconds.

During the builder's trials of one of these boats the ship was driven at full speed of fifteen knots towards the observing tug until a whistle blast signalled for a crash dive. The submarine was foaming through the water with both of her thousand horsepower oil engines drawing at full power and was riding high in the water. She was steering to pass close along side of the tug.

When the signal was given for the dive the white vapor of the exhaust blast pouring out of either side astern the submarine ceased abruptly. She was switched to her electric motors for submergence and still came on at unchecked speed about three times her length astern the tug. But those on the tug could see that she was sinking swiftly into the water. The big craft was clear under except for her conning tower as she reached the tug's stern. At that point her diving rudders swung her nose down and in anther fifty feet only the slim, rod-like length of the main periscope appeared on the surface.

When the periscope reached a point opposite the pilot house the commander of the submarine ordered rudders up and the big craft "porpoised" to the surface to show a brief glimpse of her super-structure, deck and finally her tilted stern, then vanished completely from sight in an eight-degree "crash" that carried her at full speed to a depth of ninety feet, where she flattened out like a gliding airplane and swung off on a long curve. The whole operation had taken less than sixty seconds and the boat was so perfectly handled and responded so perfectly to her controls that she passed the tug less than her own width. Fifteen minutes later she slid into sight again a half mile away and lay waiting for her observers.—*Army and Navy Journal,* 3 June, 1922.

Examinations for Promotion in the Navy.—As we have previously announced, the bureau of navigation has decided that all those ensigns of the Naval Academy class of 1919 (who were graduated June 6, 1919), will be examined on their stations on June 12, excepting those on the Asiatic station, who will be examined on July 10. These examinations will

start simultaneously under instructions which have been issued by the bureau this week. Those line officers who were recently commissioned in the permanent regular navy from lower grades will, as we have already stated, be given more time in which to prepare. They have been due for promotion in grade for some time, but their examinations have been delayed again, partly due to the considerable number who are detailed to duty in connection with the decommissioning of the destroyers. Orders are now being issued for their examinations on or after August 1, and examining boards on the stations will, as in the case of the Naval Academy ensigns, start the examinations at the same time, but not before August 1.

Line officers whose promotion is dependent upon the distribution of the officers in grade will not be examined until later. A selection board will probably be convened at the navy department at the end of June, at which time it will be practicable to make a redistribution based upon the increase to the line from the graduating class of the Naval Academy. The personnel of the selection board has not yet been decided upon. The names of all officers in the grades of captain, commander and lieutenant commander who, on November 30, 1922, will have completed four years' service in their respective ranks (including service under temporary appointments), will be submitted for the consideration of the selection board, and all officers who are eligible are invited by the bureau to study paragraphs 4 and 5 of article 1655, Navy Regulations, which permit those officers to forward statements for the board inviting attention to any matters of record pertinent to their advancement. These statements should be forwarded to the bureau of navigation at an early date. Medical officers are instructed to submit, on or about June 20, the data required under General Order 385 relating to the eligible officers. Officers selected by the board will be examined later, whenever their services can be spared. Line officers who are due for promotion to the grades of lieutenant and lieutenant commander will be ordered to appear before supervisory boards as soon as the redistribution is made. The bureau expects that all these examinations will be completed during July and August.

Selection boards will also be convened at about the same time for the chaplain corps, the civil engineer corps and the medical corps, the membership of which boards has not yet been selected. Examinations will be held in August for those officers of the supply corps who have become eligible in regular course for promotion in rank. The names of the junior officers of the supply corps who are due for promotion have heretofore been published in these columns.—*Army and Navy Register,* 27 May, 1922.

NAVAL CATAPULT TRIALS.—The airplane-discharging catapult installed recently on board the battleship *Maryland,* flagship of the Atlantic fleet, was given its first test with an airplane at Yorktown, Va., on May 24 in the presence of Admiral Hilary P. Jones, commander-in-chief of the fleet, and his staff and aviation officers from the bureau of aeronautics, naval air station at Hampton Roads, and the airplane carrier *Langley.* A Vought pursuit seaplane of the single float type was used. The machine was piloted by Lieutenant Andrew C. McFall, with Lieutenant DeWitte C. Ramsey, aviation aide to Admiral Jones, as passenger. Only one discharge was attempted. The machine took off satisfactorily and everything pertaining to the mechanism functioned perfectly.—*Army and Navy Register,* 27 May, 1922.

BATTLESHIP "UTAH" TO BE DOCKED AT PORTSMOUTH.—The United States battleship *Utah* will arrive at Portsmouth today (Wednesday) to be placed in the floating dock. She is to remain in port about two weeks, and will give leave to officers and men during this period.—*Naval and Military Record,* 11 May, 1922.

Monthly Rates of Pay and Allowances of Officers of the Army, Effective July 1, 1922

Grade.	Pay period	Annual base pay	Less than three years' service	Over three years' service	Over five years' service	Over six years' service	Over seven years' service	Over nine years' service	Over ten years' service	Over twelve years' service	Over seventeen years' service	Over fifteen years' service	Over fourteen years' service
General of the Armies of the U. S.		13,500	1,125.00	1,125.00	1.125,00	1 125.00	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00
Major general		8,000	666.67	666.67	666.67	666.67	666.67	666.67	666.67	666.67	666.67	666.67	666.67
Brigadier general		6,000	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00
Colonel:													
Over 26 years' service	6	4,000	......	......	......	......	......	......	......	......	......	......	......
First appointment above captain	6	4,000	333.33	350.00	350.00	366.67	366.67	383.33	383.33	400.00	400.00	416.67	416.67
Appointed under section 24, act June 4, 1920	6	4,000	333.33	350.00	350.00	366.67	366.67	383.33	383.33	400.00	400.00	416.67	416.67
Less than 26 years' service	5	3,500	291.67	306.25	306.25	320.83	320.83	335.42	335.42	350.00	350.00	364.58	364.58
Lieutenant colonel:													
Over 30 years' service	6	4,000	......	......	......	......	......	......	......	......	......	......	......
Over 20, less than 30 years	5	3,500	......	......	......	......	......	......	......	......	......	......	......
First appointment above captain	5	3,500	291.67	306.25	306.25	320.83	320.83	335.42	335.42	350.00	350.00	364.58	364.58
Appointed under section 24, act June 4 1920	5	3,500	291.67	306.25	306.25	320.83	320.83	335.42	335.42	335.00	350.00	364.58	364.58
Less than 20 years' service	4	3,000	250.00	262.50	262.50	275.00	275.00	287.50	287.50	300.00	300.00	312.50	312.50
Major:													
Over 23 years' service	5	3,500	......	......	......	......	......	......	......	......	......	......	......
Over 14, less than 23 years	4	3,000	......	......	......	......	......	......	......	......	300.00	312.50	312.50
First appointment above 2d lieutenant	4	3,000	250.00	262.50	262.50	275.00	275.00	287.50	287.50	300.00	300.00	312.50	312.50
Appointed under section 24, act June 4 1920	4	3,000	250.00	262.50	262.50	275.00	175.00	287.50	287.50	300.00	300.00	312.50	312.50
Less than 14 years' service	3	2,400	200.00	210.00	210.00	220.00	220.00	230.00	230.00	240.00	......	......	......
Captain:													
Over 17 years' service	4	3,000	......	......	......	......	......	......	......	......	......	......	312.50
Over 7, less than 17 years	3	2,400	......	......	......	......	220.00	230.00	230.00	240.00	240.00	250.00	......
First appointment above 2d lieutenant	3	2,400	200.00	210.00	210.00	220.00	220.00	230.00	230.00	240.00	240.00	250.00	......
Present rank July 1, 1920, or earlier	3	2,400	200.00	210.00	210.00	220.00	220.00	230.00	230.00	240.00	240.00	250.00	......
Less than 7 years' service	2	2,000	166.67	175.00	175.00	183.33	......	......	......	......	......	......	......
First lieutenant:													
Over 10 years' service	3	2,400	......	......	......	......	......	......	230.00	240.00	240.00	250.00	250.00
Over 3, less than 10 years	2	2,000	......	175.00	175.00	183.33	183.33	191.67	......	......	......	......	......
First appointment above 2d lieutenant	2	2,000	166.67	175.00	175.00	183.33	183.33	191.67	......	......	......	......	......
Less than 3 years' service	1	1,500	125.00	......	......	......	......	......	......	......	......	......	......
Second lieutenant:													
Over 5 years' service	2	2,000	......	......	175.00	183.33	183.33	191.67	191.67	200.00	200.00	208.33	208.33
Less than 5 years' service	1	1,500	125.00	131.25	......	......	......	......	......	......	......	......	......

Monthly Rates of Pay and Allowances of Officers of the Army, Effective July 1, 1922

Grade;	Over eighteen years' service	Over twenty years' service	Over twenty-one years' service	Over twenty-three years' service	Over twenty-four years' service	Over twenty-six years' service	Over twenty-seven years' service	Over thirty years' service	Rental and subsistence allowances for fiscal year 1923. RENTAL With dependents	RENTAL No dependents	SUBSISTENCE (30-day month) With dependents	SUBSISTENCE (30-day month) No dependents
General of the Armies of the U. S.	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00	1,125.00	(a)	(a)	(a and b)	(a and b)
Major general	666.67	666.67	666.67	666.67	666.67	666.67	666.67	666.67	$120	$80	$36	$18
Brigadier general	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	120	80	36	18
Colonel:												
Over 26 years' service	......	......	......	......	......	466.67	483.33	500.00	120	80	36	18
First appointment above captain	433.33	433.33	450.00	450.00	466.67	466.67	483.33	500.00	120	80	36	18
Appointed under section 24, act June 4, 1920	433.33	433.33	450.00	450.00	466.67	466.67	483.33	500.00	120	80	36	18
Less than 26 years' service	379.17	379.17	393.75	393.75	408.33	......	......	......	120	80	54	18
Lieutenant colonel:												
Over 30 years' service	......	......	......	......	......	......	......	479.17	120	80	36	18
Over 20, less than 30 years	......	379.17	393.75	393.75	408.33	408.33	422.92	......	120	80	54	18
First appointment above captain	379.17	379.17	393.75	393.75	408.33	408.33	422.92	......	120	80	54	18
Appointed under section 24, act June 4, 1920	379.17	379.17	393.75	393.75	408.33	408.33	422.92	......	120	80	54	18
Less than 20 years' service	325.00	......	......	......	......	......	......	......	100	60	54	18
Major:												
Over 23 years' service	......	......	......	393.75	408.33	408.33	422.92	437.50	120	80	54	18
Over 14, less than 23 years	325.00	325.00	337.50	......	......	......	......	......	100	60	54	18
First appointment above 2d lieutenant	325.00	325.00	337.50	......	......	......	......	......	100	60	54	18
Appointed under section 24, act June 4, 1920	325.00	325.00	337.50	......	......	......	......	......	100	60	54	18
Less than 14 years' service	......	......	......	......	......	......	......	......	80	60	36	18
Captain:												
Over 17 years' service	325.00	325.00	337.50	337.50	350.00	350.00	362.50	375.00	100	60	54	18
Over 7, less than 17 years	......	......	......	......	......	......	......	......	80	60	36	18
First appointment above 2d lieutenant	......	......	......	......	......	......	......	......	80	60	36	18
Present rank July 1, 1920, or earlier	......	......	......	......	......	......	......	......	80	60	36	18
Less than 7 years' service	......	......	......	......	......	......	......	......	60	40	36	18
First lieutenant:												
Over 10 years' service	260.00	260.00	270.00	270.00	280.00	280.00	290.00	300.00	80	60	36	18
Over 3, less than 10 years	......	......	......	......	......	......	......	......	60	40	36	18
First appointment above 2d lieutenant	......	......	......	......	......	......	......	......	60	40	36	18
Less than 3 years' service	......	......	......	......	......	......	......	......	40	40	18	18
Second lieutenant:												
Over 5 years' service	216.67	216.67	225.00	225.00	233.33	233.33	241.67	250.00	60	40	36	18
Less than 5 years' service	......	......	......	......	......	......	......	......	40	40	18	18

(a) Allowances fixed by the President.
(b) Allowances in this column are on the basis of a month of 30 days. For a month of a greater or less number of days the amounts should be correspondingly increased or decreased.
Pay and allowances of officers of corresponding rank in other services are the same as those for army officers—*Army and Navy Register*, 27 May, 1922.

PAY AND ALLOWANCES OF CHIEF WARRANT OFFICERS, U. S. NAVY

	PAY											ALLOWANCES WITH DEPENDENTS *Rental allowance	ALLOWANCES WITH DEPENDENTS Subsistence allowance	ALLOWANCES WITHOUT DEPENDENTS *Rental allowance	ALLOWANCES WITHOUT DEPENDENTS Subsistence allowance
After 12 years' commissioned service...	Over 12 years $2,880	Over 15 years $3,000	Over 18 years $3,120	Over 21 years $3,240	Over 24 years $3,360	Over 27 years $3,480	Over 30 years $3,600					960	438	720	219
After 6 years' commissioned service......	Over 6 years 2,200	Over 9 years 2,300	Over 12 years 2,400	Over 15 years 2,500	Over 18 years 2,600	Over 21 years 2,700	Over 24 years 2, 800	Over 27 years $2,900	Over 30 years $3,000			720	438	480	219
With less than 6 years' commissioned service	Under 3 years 1,500	Over 3 years 1,575	Over 6 years 1,650	Over 9 years 1,725	Over 12 years 1,800	Over 15 years 1,875	Over 18 years 1,950	Over 21 years 2,025	Over 24 years 2,100	Over 27 years $2,175	30 years $2,250	480	219	480	219

*Rental allowances do not accrue to any officer on shore duty furnished public quarters or to officers without dependents when on sea or field duty.

NOTE

The rates of pay shown in the above table become effective on July 1, 1922, for all chief warrant officers except: That those officers whose base pay plus longevity (under the act of May 13, 1908) is, on June 30, 1922, in excess of their pay as given above, shall continue to receive the base play plus longevity to which entitled on June 30, 1922, until such time as their pay under the above table exceeds this amount.—*Army and Navy Register*, 27 May, 1922.

Pay and Allowances of Warrant Officers, U. S. Navy

	Less than 4 years' service	Over 4 years' service	Over 8 years service	Over 12 years' service	Over 16 years' service	Over 20 years' service
Army mine planter service:						
Master	185.00	194.25	203.50	212.75	222.00	231.25
First mate	141.00	148.05	155.10	162.15	169.20	176.25
Second mate	109.00	114.45	119.90	125.35	130.80	136.25
Chief engineer	175.00	183.75	192.50	201.25	210.00	218.75
Assistant engineer	120.00	126.00	132.00	138.00	144.00	150.00
Other warrant officers	148.00	155.40	162.80	170.20	177.60	185.00

—*Army and Navy Register*, 27 May, 1922.

Pay of Enlisted Personnel of the Navy and Coast Guard Under Joint Service Pay Bill

Grade	Base pay first 4 years' service	B. P. plus 10% second 4 years' service	B. P. plus 15% third 4 years' service	B. P. plus 20% fourth 4 years' service	B. P. plus 25% after 16 years' service
First					
C. P. O. with permanent appointment	$126	$138.60	$144.90	$151.20	$157.50
C. P. O. with acting appointment	99	108.90	113.85	118.80	123.75
Second					
Petty officer, 1c.; cabin steward, and cooks	84	92.40	96.60	100.80	105.00
Third					
Petty officer, 2c.; wardroom stewards, and cooks, steerage steward and cooks	72	79.20	82.80	86.40	90.00
Fourth					
Petty officer, 3c.; fireman, 1c.; warrant officer, stewards and cooks	60	66.00	69.00	72.00	75.00
Fifth					
Nonrated men, 1c.; fireman, 2c., and mess attendant, 1c	54	59.40	62.10	64.80	67.50
Sixth					
Nonrated men, 2c.; fireman, 3c., and mess attendant, 2c	36	39.60	41.40	43.20	45.00
Seventh					
App. sea. and mess attendant, 3c	21	23.10	24.15	25.20	26.25

Notes.—Any enlisted man in the navy on June 30, 1922, whose base pay plus permanent additions exceeds the rate of pay provided above for his rating and length of service shall continue to receive his old base pay plus permanent additions during the remainder of his enlistment (or extension entered into prior to July 1, 1922, so long as his rating is not changed. Any "change in rating" or enlistment or extensions entered into on or subsequent to July 1, 1922, shall carry the above rates of pay.

The secretaries of the navy and treasury are authorized to fix the pay grades for the various enlisted ratings in the navy and coast guard.

Mates in the navy will receive the pay of the first grade of enlisted men.

The pay of the insular force of the navy shall be one-half the rates of pay prescribed for corresponding ratings in the navy.

Present reenlistment gratuity is repealed, and in lieu thereof an enlistment allowance of $50 for each year served in the previous enlistment (not to exceed $200) for the first three grades and $25 for each year (not to exceed $100) for the other grades for reenlistment on honorable discharge within 3 months.

Retired men will have their retired pay computed on the basis of the new schedule after July 1.—*Army and Navy Register*, 27 May, 1922.

NEW NAVY UNIFORM REGULATIONS.—Departmental approval has been given to the changes in the navy uniform regulations, which have been brought about as a result of the deliberations of a special board convened at Hampton Roads last winter, composed of Rear Admiral Hugh Rodman, president, and Rear Admiral Philip Andrews and Captain R. Z. Johnston, members, with Lieutenant F. C. Fechteler, recorder. The board's report bears date of March 23, but the matter has been under consideration in the bureau of navigation and by the secretary of the navy for several weeks. Secretary Denby prior to his departure for the Orient approved

the regulations, subject to some changes which will be made in the bureau of navigation. It is probable that some minor changes will necessarily be made after the officer's uniform shop has gone over the specifications, so as to avoid the inclusion of any innovation which would be impracticable from a tailoring point of view.

The task of rewriting the uniform regulations and preparing them for the printer and the publication of the regulations to the naval service will probably consume several months. While the changes will not become effective until they have been published to the service, existing orders require every officer in the navy to be equipped with the required uniform outfit by the first of July of this year.

As we have heretofore predicted, the changes as recommended by the bureau of navigation and approved by the secretary contain nothing of a radical nature or which would arouse controversy, and no changes are made which would cause undue expense. A recommendation of the majority of the board that the buttons on the officers' overcoat be changed from brass to black was not adopted and the overcoat buttons remain as they are. No change in the sleeve insignia of staff officers was approved. No recommendation regarding the uniform of bluejackets will prevent the eventual issue of the millions of dollars worth of uniforms still in stock as the result of war purchases. The chief petty officers, however, will have a neat, light raincoat for wear ashore.

The officers' cap is increased in size, but the insignia on the visor remains the same; the chief petty officers' cap is also broadened in the crown. Some slight changes have been made in the method of wearing decorations, badges and ribbons, and the word "medals" as it now appears in the regulations will be changed to "decorations." The word "forestry" is omitted from the uniform regulations, that being a trade name. Overcoats and raincoats for officers will reach one-third the distance from the knee-cap to the ground.

The New Overcoat

The new specifications adopted for the officers' overcoat read as follows:

Overcoat—Double breasted, smooth-faced cloth, lined with black material, semifitting at waist, full skirt, reaching one-third the distance from the knee-cap to the ground, shaped at waist, and held by half-belt at back, lapel and convertible collar, so that it may be worn buttoned to the neck if desired, fitted with latch in front of collar, collar to be 4½ inches wide at center of back, point of lapel to be as wide as point of collar, the two to be closely together, notch of lapel about 4½ inches deep, length of lapel about 11 inches, two rows of 5 medium-sized navy brass buttons about 6 inches apart, first button at neck under collar, second at bottom of lapel, bottom button at height of crotch, four lower buttons equally spaced, vent in center of back from 16 to 25 inches from bottom, fitted with three small navy black buttons, the right side overlaping the left 2 inches, vertical slit 4 inches long over left hip for sword belt slings, so that sword may be worn on outside, slit fitted with flap, coat to be full in back, fitted with straps let into side seams at waist each 2¼ inches wide, right strap fitted with two medium-sized navy black buttons 3 inches apart, left strap with two buttonholes similarly spaced, two outside welted pockets, welts 1⅝ inches wide, openings 8 inches long, center of opening in same, vertical line with front seam of armhole at height of hip bone, bottom of opening 2 inches to the rear of upper one, inside pockets at discretion, edges of collar, back straps, pocket welts and front edges of coat stitched with one row of plain stitching ½-inch from edges, all seams plain, sleeve markings of lustrous black mohair braid to designate rank only, shoulders fitted for shoulder marks, which will always be worn with overcoats.

New Regulations for Cap

Caps, Blue, White and Aviation—Frame so constructed that a blue cloth, white duck, green and khaki cover may be fitted, to be stiff, standing and flaring throughout its circumference so that the center edge of the cover may have a rolled or rounded effect rather than one having a thin edge, general measurements with cover on, length of crown 10 inches, width 9½ inches, height in rear from bottom of frame 2¾ inches, in front from visor to top 3¾ inches, covers to be without welt, neatly stitched on each side, crown distended by stiffening in frame all around, band 1½ inches wide with welt ⅛ inch at top and bottom, lower welt ⅛ inch from base of cap, band of lustrous black mohair braid around cap between welts and visors as described in paragraph 33 for the different grades, sloping downward at an angle of 35 degrees, rounded, lined underneath with green leather, bordered with narrow strip of patent leather 3/16 inch wide, light colored leather sweat band from base of cap within 1 inch of top, chin strap of leather faced with ½ inch gold lace for commissioned officers, ¼ inch for warrant officers, fitted with two gold lace slides of corresponding widths, strap fastened at its ends with two small-sized screweye navy buttons spaced about 12 inches apart, strap to rest on upper edge of visor, device embroidered on band and backing combined, so that one-half will show above the band. Device embroidered that it may be inscribed in a circle 2½ inches in diameter for commissioned officers, gold crossed foul anchors, superimposed by silver shield, surmounted by silver spread eagle; for warrant officers the crossed anchors without shield or eagle.

New Mess Jacket

Mess Jacket—Similar in cut to body of evening dress coat, but to descend to hips to fully cover top of trousers, slightly roached over hips, peaked behind, two buttonholes, on each side below lapel, 3 inches apart, 1½ inches from edge, two medium-sized brass buttons on each side below lapel abreast buttonholes, 2 inches from edge, shoulders fitted for shoulder marks which should be worn with this uniform, to be held together by two linked medium-sized brass buttons.—*Army and Navy Register,* 27 May, 1922.

BOARD'S LOSS LESS IN APRIL.—Expenses of the shipping board for April in excess of income from vessel operations, including overhead, repairs, insurance and lay up expenses, amounted to $2,977,246, compared with an excess of expenses over income for March of $3,704,155. This is the most favorable monthly result obtained since the present board took office.

Voyages reported for March totaled 188, compared with 185 for April.

The net excess of outlay over income on voyage operations for April, excluding overhead, repairs and insurance, was announced as $667,751, compared to $1,019,860 for March, the improvement being attributed to increased revenues from cargo vessels and to better results obtained in the operation of passenger vessels. Operation of the passenger vessels for April showed an excess of income over outlay, excluding overhead, repairs and insurance, of $64,853.

These favorable results were obtained despite a decrease in tanker voyages. Tanker voyages in March were 37 and in April 32, and the excess of income over outlay for April was $142,732, as against $290,868 for March. Charter hire receipts for the month of April were $74,108, as against $88,139 for the month of March. The lay-up expenses increased from $381,038 in March to $433,839 in April.

The favorable outcome for April was attained with but slight increase in the gross revenues received, the gross revenues for April exceeding March by only $86,116. The improvement in the operating results as

compared with the previous month amounting to $726,908 has been largely accomplished by the operating economies instituted and the consequent reduction in the operating expenses.

The largest saving was in the outlay for repairs, which in March amounted to $1,313,299, as compared with $917,985 for the month of April.

In its accounting the board does not figure capital charges and several forms of insurance which the board carries itself. These omissions are in line with established Government practice, but this inability to make a proper allowance for capital charges in these monthly statements results in a failure to give a true picture of the losses incurred by the board such as all commercial statements should reflect.

While the cost of operations for April was the lowest for any month in almost two years, Chairman Lasker does not desire the impression to be conveyed that this low figure could be consistently maintained throughout the year, inasmuch as April is one of the best months of the year in world shipping.—*Nautical Gazette*, 5 June, 1922.

APRIL SHIPBUILDING OUTPUT IN DETAIL.—The bureau of navigation, department of commerce, reports 106 sailing, steam, gas and unrigged vessels of 34,308 gross tons built in the United States and officially numbered during the month of April, 1922, as follows:

	Atlantic and Gulf		Pacific		Great Lakes		Western Waters		Total	
	No.	Gross	No.	Gross	No.	Gross	No.	Gross	No.††	Gross
WOOD										
Sailing	7	432	..	....	..	...	..	....	7	432
Steam	3	188	2	119	..	...	3	243	8	550
Gas	40	1,208	11	299	3	96	5	137	59	1,740
Unrigged	9	2,928	4	1,091	4	260	2	40	19	4,319
Total	59	4,756	17	1,509	7	356	10	420	93	7,041
METAL										
Sailing	..	.....	..	....	..	...	..	....	...	.....
Steam	2	17,930	1	15	1	54	..	....	4	17,999
Gas	3	8,310	..	....	..	...	3	67*	6	8,377
Unrigged	2	702	..	....	1	189	..	....	3	891
Total	7	26,942	1	15	2	243	3	67*	13	27,267
TOTALS										
Sailing	7	432	..	....	..	...	..	....	7	432
Steam	5	18,118	3	134	1	54	3	243	12	18,549
Gas	43	9,518	11	299	3	96	8	204	65	10,117
Unrigged	11	3,630	4	1,091	5	449	2	40	22	5,210
Grand Total	66	31,698	18	1,524	9	599	13	487*	106	34,308

*Includes 2 composite vessels of 21 gross tons.

The above total includes 31 rigged vessels of 1,319 gross tons and 14 unrigged vessels of 3,409 gross tons, total 45 vessels of 4,728 gross tons built in years previous to 1922. Of the above total, 1 vessel of 13,712 gross tons was built for the United States shipping board.

The largest of these vessels were the passenger steamer *Western World* built for the United States shipping board and the motorship *California* built for the American Hawaiian steamship company.—*Nautical Gazette*, 20 May, 1922.

SEAGOING STEEL TONNAGE, BUILDING AND CONTRACTED FOR IN THE UNITED STATES, AS OF MAY 1, 1922

Yard	Hull	Name	Type	Class	Gross	Owners	Machinery	H.P.	DIMENSIONS L.	B.	D.	Fuel	Remarks
Beth. S. B. Cpn., Ltd., Sparrows Point Plant	4197	*Western World*	Pass. Cargo	A.B.	10,500	U. S. Shipping Board	Turbines	12000	518	72	50	Oil	
	4212	*Marore*	Oil & Ore	A.B.	13,500	International Pet.	Turbines	....	550	72	44	Oil	Combination Carrier
	4213	*Steelore*	Oil & Ore	A.B.	13,500	International Pet.	Turbines	....	550	72	44	Oil	Combination Carrier
Alameda Plant	5309	*Chilore*	Coal & Ore	A.B.	13,500	Ore Steamship Co.	Reciproc.	....	550	72	44	Oil	Combination Carrier
	5310	*Lebore*	Coal & Ore	A.B.	13,500	Ore Steamship Co.	Reciproc.	....	550	72	44	Oil	Combination Carrier
Federal S.B. Co.	68		Cargo	A.B.	6,000	U. S. Steel Prod.	Turbine	3500	442	56	30	Coal or Oil	
	72		Pass. & Cargo	A.B.	5,000	Merchant & Miners	Reciproc.	2700	350	52	35	Oil	
	73		Pass. & Cargo	A.B.	5,000	Merchant & Miners	Reciproc.	2700	350	52	35	Oil	
Great Lakes Engineering	242		Cargo	A.B.	6,585	Wilson Transit Co.	Reciproc.	1900	580	60	32	Coal	G. L. service
Manitowoc S.B. Co.	204		Cargo	A.B.	4,900		Reciproc.	1650	430	56	34	Coal	G. L. service
Merchant S. B. Cpn.	385	*Californian*	Cargo	Dual	7,800	Am. Hawaiian S. S. Co.	Diesel	4500	445	60	39	Oil	
	386	*Missourian*	Cargo	Dual	7,800	Am. Hawaiian S. S. Co	Diesel	4500	445	60	39	Oil	
New York S. B. Cpn.	264	*Eurana*	Tanker	Dual	6,800	Builders account	Reciproc.	3000	420	57	32	Oil	
	265		Tanker	Dual	6,800	Builders account	Reciproc.	3000	420	57	32	Oil	
Pusey & Jones	1020		Pass. Cargo	A.B.	2,710	Seaboard Bay Line	Reciproc.	2860	330	58	19	Coal	Coastwise
	1021		Pass. Cargo	A.B.	2,710	Seaboard Bay Line	Reciproc.	2860	330	58	19	Coal	Coastwise
Sun S. B. Cpn.	42	*Pennsylvania Sun*	Tanker	Dual	9,000	A. G. W. I.	Reciproc.	4500	...	..	..		
	53		Pass. Cargo	A.B.	4,000	Inter-Island Nav. Co.	Reciproc.	5600	...	..	..		
Tebo Yacht Basin	21	*Cynthia*	Passenger	A.B.	350	M. B. Mills	Diesel	450	129	23	12	Oil	Yacht

—*Bulletin*, American Bureau of Shipping, May-June, 1922.

PANAMA CANAL TRAFFIC.—During March 234 commercial vessels of 776,034 net tons passed through the Panama Canal carrying 960,089 tons of cargo. In the corresponding month of last year 255 ships of 1,112,818 tons and carrying 1,084,563 tons of cargo passed through the waterway. The showing by countries follows:

Nationality	No. of Ships	Net Tons	Tons of Cargo
British	75	233,310	287,319
Chilean	4	7,842	1,693
Danish	2	7,251	13,970
Dutch	5	13,026	18,173
French	6	19,625	26,259
German	5	11,064	12,170
Italian	1	3,579	1,400
Japanese	12	47,268	81,812
Norwegian	13	35,498	43,336
Peruvian	5	11,708	4,326
Swedish	3	6,507	10,366
United States	103	379,356	459,265
Totals	234	776 034	960,089

—*Nautical Gazette*, 20 April, 1922.

"GREAT NORTHERN'S" ACCIDENT.—While the *H. F. Alexander*, formerly the *Great Northern*, was proceeding down the Delaware River on her maiden trip since her reconditioning, she collided with the British freighter *Andree*, which sank. Both Captain Lustie and Chief Engineer Clayton, who were on the *H. F. Alexander*, were acting in a similar capacity on her sister ship, the *Northern Pacific*, when she burned. It looks as though these gentlemen must have walked under a ladder.—*Nautical Gazette*, 27 May, 1922.

"GEORGE WASHINGTON" REPAIRED IN RECORD TIME.—The liner *George Washington* had recently to undergo some repairs, which the German Bremerhaven yard estimated would take nine days of twenty-four hours each and a New York yard six days. As the vessel was in the trans-Atlantic service, making regular scheduled trips, it was impossible to lay her up for that length of time. The shipping board therefore arranged to have the work done in the Boston navy yard, where she arrived Monday, May 1, at 3:30 P. M.

After this great ship had been docked the repairs, consisting of removing propellers, hauling shafts, rewooding bearings and putting on two coats of bottom paint, were completed at noon Thursday, May 4, the actual number of hours being sixty-four.—*Nautical Gazette*, 27 May, 1922.

"LEVIATHAN'S" NAME TO REMAIN.—In a formal letter, President Harding has requested the shipping board not to rechristen the *Leviathan* after himself but to allow her present name to remain. While not insensible to the proffered compliment, the President says that it would be a mistake to give the *Leviathan* another appellation as her present name stands as a national sentiment and one that symbolizes the participation of this great vessel in the world war. The board has acceded to the President's wish and has rescinded its action in changing the name of its largest ship.—*Nautical Gazette*, 20 May, 1922.

AERONAUTICS

THE AIRSHIP OF THE FUTURE.—"The airship of the future will be of all-metal construction, which will be of fundamental assistance in the development of these craft for world-wide commercial use in aerial transportation," according to Herman T. Kraft, chief aeronautical engineer of the Goodyear Tire and Rubber company.

Two factors must be considered above all others in the construction of airships of any kind, namely safety and durability, in Mr. Kraft's opinion. There must be absolute protection against structural failure as well as against fire. As long as airships are constructed of inflammable materials, there will always be some danger of fire, especially with the use of hydrogen gas.

Uniform distribution of strength, which is the major basis of safety, is exceedingly difficult to obtain even in a rigid airship because of the very complicated calculations necessary to be sure of safety, since we have to figure unknown factors and allow for them in every airship we build. With an all-metal ship it will be possible to make those calculations much more exact than was hitherto the case, owing chiefly to the reduction of the number of small riveted parts.

The entire surface of the ship will be of metal, thereby assuring greater durability and reduction of fire hazard. Tests have been made which indicate that even hydrogen ignited on the surface of an all-metal container will burn freely without heating up the metal, so that there would be no danger of the envelope being consumed by the flame.

Unquestionably the building of such a ship would be a mammoth undertaking, but with the present engineering knowledge available its construction would be entirely practicable. Indeed it has been attempted before, so far back as 1897, and a flight was actually made with an all-metal ship with conical ends and cylindrical body. This ship was not a success, chiefly because engineering knowledge had not progressed sufficiently in aeronautics, and proper construction materials were not available.

Aluminum sheeting would doubtless be the metal employed, with strips of very flexible non-inflammable material or wire lacing interposed at various points to take care of the flexing of the envelope while in flight. Approximately 1,000,000 cubic feet capacity, with a theoretical length of 350 feet and a maximum diameter of about 75 feet would be the proper size of ship to make to prove its practicability.

In any consideration of all-metal ships, the question of gas-tight seams has generally been a bugbear, but it has now been conclusively proven that the seams in such a ship can be made gas-tight, especially in a container carrying low pressures. The actual building would be somewhat of a problem even in a thoroughly modern plant, but by using airbags to keep lifting the ship progressively, while under construction, and erecting superstructures in the hangars the riveting, lacing and assembling could easily be handled. The rigidity of the structure, which would have some degree of flexibility, would eliminate many of the structural difficulties in rigid airships of the present design.—*Aviation*, 29 May, 1922.

SOME NAVAL AVIATION DEVELOPMENTS.—One of the important accomplishments in aviation by the navy during the past year was the successful development of torpedo-carrying seaplanes. Three types have been produced under navy control and with navy funds by contractors. One type is an unbraced monoplane of low visibility and high speed. Another is made entirely of metal. The third is a small, compact biplane with interchangeable landing gear so that it can be used to land on a carrier or on the sea. To meet the special demand of the navy for a small combat plane of high performance, and yet very compact and easily taken down for stowage, there has been designed and built in the naval shops, and successfully flown, a new machine equipped with the new Lawrence air-cooled engine developed with naval funds for this project. The successful consummation of the combined project of a radically new type of both engine and plane was very difficult from a technical standpoint, but it has proved remarkably successful.

Production of American-made duralumin by and for the navy has made it possible for airplane builders to make use of that material in airplane construction. One navy contractor today is flying for test a torpedo plane built all of duralumin, and this is the first all-metal airplane built by an American contractor. Another navy contractor is building all-metal spotting planes for the fleet, and others are using metal in a large part of their construction.—*Army and Navy Register,* 20 May, 1922.

BRITISH SAFETY FUEL TANK AWARDS.—The British air ministry announces: The prizes in the Air Ministry Competition for Safety Fuel Tanks for Aircraft have been awarded as follows:

First Prize—£1,400. The India-Rubber, Gutta Percha and Telegraph Works company, Limited, Silvertown, London, E. 16.

Second Prize—£400. Imber Anti-Fire Tanks, Limited, West Road, Tottenham, London, N. 17.

Third Prize—£200. Commander F. L. M. Boothby, (R. N. Retired) *Overway,* Tilford, Surrey.

The competition was arranged in order to promote the evolution of a reliable type of fuel tank for service and commercial aircraft, which would reduce the risk of fire, due to crashing or hostile action, to a minimum.

Twenty-six entries were received for the competition, which was open to the world, and eighteen different types of tanks were actually submitted for test.

The judges appointed by the air council consider that the competition has resulted in the achievement of the objects for which it was instituted and has produced a type of safety fuel tank which, although capable of improvement in several minor respects, is available for immediate introduction on service and civil aircraft and which, for a slight increase in weight over and above that of the standard service steel tank, gives almost complete immunity from fire, either in a crash or in action with enemy machines.

All the tanks tested, with a few exceptions, showed marked superiority in almost every respect over the standard Service steel tank now generally in use.

The judges were: Group Captain E. F. Briggs, (deputy director of research; Major B. C. Carter (directorate on research); Major J. H. Ledeboer (directorate of research); Mr. G. Cockburn (accidents investigation branch); Major J. P. C. Cooper (accidents investigation branch); Mr. H. Grinsted (royal aircraft establishment).

The regulations governing the competition provided that each entrant had to submit two tanks for preliminary trials and that the three most successful competitors in the first stage should submit four more tanks for final trial.

Description of Winning Tanks

Details of the tanks submitted by the three winning competitors for the preliminary tests are as follows:

Tanks Submitted by India-Rubber and Gutta Percha Co., Ltd., Silvertown, London

	No. 1	No. 2
Weight of tank	78.75 lbs.	81.25 lbs.
Capacity of tank	37.7 gals.	38.2 gals.
Weight of gallon capacity	.58 lbs.	.66 lbs.
Shape of tank	Cubical	

Each consisted of a welded sheet steel rectangular tank with no frame or baffles of any sort, but with each side slightly dished inwards, inserted in a detachable rubber case.

These tanks were slung in the fuselage by means of webbing.

Tanks Submitted by Imber Anti-fire Tanks, Ltd., Tottenham, London

	No. 1	No. 2
Weight of tank	50 lbs.	51.5 lbs.
Capacity of tank	30 gals.	29.3 gals.
Weight per gallon capacity	1.66 lbs.	1.76 lbs.
Shape of tank	Elliptical	

The tank consisted of a light gauge, tinned steel shell which was separated from the inside of a framework of aluminum tubing and light gauge aluminum baffle plates. After assembly the whole of the tank had been covered with india-rubber of a suitable thickness, and all joints vulcanized.

Tanks Submitted by Commander Boothby, Tilford, Surrey

	No. 1	No. 2
Weight of tank	33.23 lbs.	35.75 lbs.
Capacity of tank	58 lbs.	66 lbs.
Weight per gallon capacity	56.8 gals.	53.7 gals.
Shape of tank	Cubical	

The tank consisted of an inner bag of 4-ply rubbered fabric capable of containing the petrol with an outer cover of rubbered fabric which was gas-tight. Non-inflammable gas was introduced into the space between the two shells and maintained under slight pressure. A drain pipe was fitted to the outer casting. The tank was fixed to the fuselage by rubber shock absorber and stringing and encased in 3-ply glued on.—*Aerial Age Weekly*, 22 May, 1922.

NAVY TO USE METAL SEAPLANES.—Secretary Denby of the navy department on May 7 authorized an announcement that the Glenn L. Martin Company of Cleveland, Ohio, has undertaken the development for the naval bureau of aeronautics of a number of seaplanes to be constructed of duralumin, a special alloy of metal, and to be used by the fleet for spotting gunfire at long ranges.

The construction of metal aircraft of duralumin is a departure for this firm, which hitherto has built planes of the ordinary wood and wire type, such as the well-known Martin bombers which were used last summer in the aeroplane bombing attacks that destroyed a number of former German ships off the entrance to the Virginia capes.

The development of metal aircraft construction in the United States, Secretary Denby said, has been made possible by the navy department in that the special alloy metal, duralumin, originally developed in Germany, has been introduced to American manufacturers in connection with the construction of the rigid airship *ZR-1* at the naval aircraft factory at Philadelphia. This work has now progressed to the point, according to naval aviation experts, where duralumin of proper quantity, and in all of the useful shapes is now available to any aircraft builder from at least two American commercial sources. The naval aircraft factory at Philadelphia has also developed special machinery and processes for its fabrication.

Aircraft manufacturers transacting business with the bureau of aeronautics of the navy have been invited frequently to visit the factory at Philadelphia to observe the metal fabrication of the work that is going on there. Besides the construction of the giant rigid airship *ZR-1*, the parts of which are being manufactured at Philadelphia for erection at the naval air station at Lakehurst, the factory is also building metal wings, pontoons and other parts for seaplanes.

Just as the surface fleet of the navy passed by the stages of evolution through the era of wood into that of steel, so it is predicted by experts that the air fleet of the naval service will proceed from the period of wood and linen to that of metal.

Secretary Denby said that the Stout Engineering Laboratories, Inc., of Detroit, were also working with duralumin. This firm has received a contract from the navy department for the construction of experimental torpedo-carrying seaplanes to be built entirely of metal, and a simple machine of this character is now under trial flights. Other manufacturers in work for the navy, it was disclosed, have employed duralumin for parts of aeroplanes with success, notably the Gallaudet Aircraft Corporation of Providence, R. I., and the Aeromarine Plane and Motor Company of Keyport, N. J.

"It is expected," said Secretary Denby, "that future naval aircraft will be built of metal, to an increasing extent. The advantages of metal over wood are especially important for tropical service."—*Aerial Age Weekly*, 15 May, 1922.

THE BOOTHBY GAS ARMORED TANK.—The Boothby Gas Armored fuel tank, which gave extraordinarily good results in the recent British air ministry crash-proof tank tests, is an entirely new departure in aircraft tank construction. The design is based on Commander F. L. M. Boothby's observations that ballast bags dropped from airships did not burst badly on hitting the ground, especially if the bags were not full, combined with the result of tests made to fireproof gas bags by surrounding them with a layer of inert gas.

The tank is a fabric tank, and consists of an inner skin of balloon fabric, lined within with gold-beater's skin, a second container also of fabric, which serves as a safeguard in the event of the inner case leaking, and finally of an outer gas-tight casing filled with cooled exhaust from the engine.

This outer case may be of fabric or three-ply, and it is possible to use the fairing of the fuselage itself as part of this outer casing.

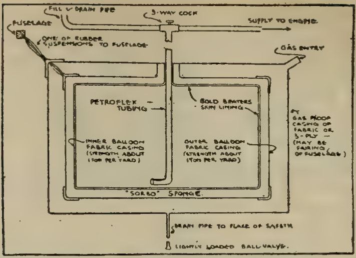
The two inner casings are supported from the fuselage on rubber shock absorbers, and to prevent swaying it is also suspended by light cords. These latter are so light that they will carry away in a crash before damage is done to the casing.

The design of petrol connections for a crash-proof tank presents difficulties for they are very liable to break in a crash, and a broken petrol pipe may be as dangerous as a punctured tank. In the Boothby tank there is a single sleeve passing through the top of the whole assembly. Into this fits tightly a length of smooth "Petroflex" tubing which reaches to the bottom of the tank, but which is only friction held in the sleeve, and can therefore pull through to a considerable extent if the tank carries away.

The outer casing is kept filled by exhaust gas taken from the engine through a small pipe long enough to cool the gas. The bottom of the gas compartment has an escape and drain pipe, fitted at its end with a lightly loaded release valve, and leading down to the undercarriage or some such place of safety. Thus the gas case is kept charged with exhaust, and if there is any petrol leakage from the inner castings the petrol is also drained off to a place of safety.

In the latest type of this tank the space between the two inner casings is filled with "Sorbo" sponge, which if punctured, as by a bullet, will swell on contact with petrol and close the hole.

The tank entered in the air ministry competition was not fitted with this sponge filling, and originally the air ministry agreed to allow the fairing of the fuselage to be used as a gas casing. The tank was designed to carry the specified quantity of 31.5 gallons, but as this type of tank requires to be only partially full to give the full extent of safety it was



actually capable of being filled to over 50 gallons, though it would not then have been crash-proof.

In the preliminary crash tests the tank did not leak at all, and was quite fit to repeat the test. About a week before the final tests the air ministry withdrew the concession that the fuselage fairing might be used as a gas container, and also said that if the tank was capable of containing more than 31.5 gallons it must be disqualified unde the rules of the competition. There was not time to design and build new tanks, so extemporized means were taken to reduce the volume, the outer casing was removed, and a rough gas casing was built inside the fuselage. The result was not as good as the original design. The crash proof qualities were about half those of the original, and the fireproof qualities were small. Nevertheless it stood five rounds of incendiary ammunition and only failed after ten rounds through one point of aim.

The sketch attached shows the general scheme very clearly. The single Petraflex tube leading out of the tank is connected to a three-way cock, so that one may either fill, drain, or supply the carbureter through it. The tank could be used for gravity feed, after starting a siphon action, or for petrol pump feed.

It may also be used for pressure feed. In this case, owing to the flexible nature of the tank, pressure may be applied outside, thus avoiding the risk of pumping impurities into the petrol container.

Finally it is a distinctly valuable feature that using this construction a crash-proof tank can be built for considerably less than that of the ordinary unprotected tinned steel type. The weight of the crash and fireproof type can be brought down to practically the same weight as the usual type.—*Aerial Age Weekly*, 29 May, 1922.

PORTUGUESE AIRMEN TO CONTINUE FLIGHT.—The Portuguese aviators, Captains Saccadura and Coutinho, sailed on May 9 from Rio Janerio for St. Paul Rock from Fernando Noronha on board the Portuguese cruiser *Republic*.

The airmen took with them their new seaplane sent from Portugal on the steamship *Bage*, which was unable to land the machine at the Rocks because of rough weather, bringing it on to Fernando Noronha. They expect shortly to resume their flight from Portugal to Brazil, cut short by the accident to their first seaplane in landing at St. Paul Rock last month.—*Aerial Age Weekly*, 22 May, 1922.

NEW NAVAL AIR EQUIPMENT.—Admiral Moffett, chief of the naval bureau of aeronautics, plans to equip floating forces with 213 air and sea planes during the coming year, it was learned recently in connection with

the presentation of the annual requirements of the bureau of aeronautics to the senate naval affairs committee. These planes are to be distributed among the eighteen battleships and other craft of the treaty fleet and two aircraft tenders or carriers, one on the Atlantic coast and the other on the Pacific.

Eighty-six VF planes, a fighting type, will become a permanent part of the fleet. They are new developments of the navy department, perfected since the war and are expected to cope with anything afloat in the air for some time to come. Besides these fighting craft, the ships afloat will carry 46 VO type spotters or observation planes carrying a crew of three men, and 27 of a similar single-seater type. There will also be 36 bombing and torpedo planes, to be known as VT planes. In place of the F5L's now serving as scouts, there will be requested eighteen newly perfected VS scout planes, bringing the total number of planes afloat with the fleet and tenders to 213. Four kite balloons have been requested for observation work.

Present plans indicate that each of the battleships will be equipped with four planes, two VF single seaters, one big VO spotter, and one VT, for torpedo and bomb carrying.

The recently developed catapults for launching planes from a ship at sea will soon be installed on each battleship. The ten new scout cruisers will also be equipped with planes and launching devices, according to present plans of the department.

Surface ships of the navy will no longer be at the mercy of aircraft, it is explained, as soon as they are equipped with these aircraft for defensive purposes. Fleet offensive power will be concentrated aboard the new aircraft carriers soon to be converted from the former battle cruisers *Lexington* and *Saratoga*. At present the U. S. S. *Wright* will be practically operated in this capacity although she is a tender or mother-ship. The *Langley*, an experimental carrier, will also be tried out as an aircraft carrier in anticipation of the receipt of the new ships.

It is understood that the marine corps is planning for the operation of twenty-four land planes, twelve as fighting craft and twelve for observation.

Shore stations of the navy will operate other craft, including about thirty torpedo and many training planes. At Pensacola today the navy has about sixty seaplanes and thirty-six land machines, which are used in the training of its pilot.—*Aviation*, 29 May, 1922.

HEAVY-OIL ENGINES FOR AIRCRAFT.—Much interest attaches to the announcement made by the national advisory committee for aeronautics in connection with its recent annual meeting that it was pursuing the development of a heavy-oil engine for use in aircraft. While the details of the invention are still held confidential, it is known that this engine is of the direct injection type which does away with both carburetor and spark plugs, the fuel being ignited by subjecting it to a suitable pressure.

The subject of heavy oil engines has such an important bearing on the future of aircraft, and in particular of airships, that it seems desirable to summarize here briefly the different aspects of the question.

The principal advantages to be derived from such an engine are: first, and foremost, safety from fire; second, fuel economy, which not only means lower fuel costs from the use of a much cheaper fuel than gasoline, but also, in all likelihood, greater weight economy in pounds of fuel consumed per horsepower hour.

We may reasonably expect at the same time some disadvantages in the heavy-oil engine. Chief among these appear a greater fixed weight of the power plant, and perhaps also a decreased flexibility of control. The great problem that must be solved will be so to work out the design that the latter two items will at least remain within practical bounds, while

preserving the reliability and, if possible, increasing it over that of present aircraft engines.

The light-weight heavy-oil engine, merely desirable today, will be the more necessary in the future as the demand for liquid fuel increases and the supply falls off. In the more distant future there may be foreseen the need of still another change—which we hope will be worked out before the need actually arises—the utilization of coal dust by direct injection in the engine.—*Aviation,* 8 May, 1922.

ORIGIN AND POSSIBILITIES OF "CURRENIUM."—(Dr. Edward Curran of Los Angeles, who has developed the new gas called "Currenium," has prepared for *Aviation* the following statement regarding it.)

This gas has been developed through a number of years of research made in the hope of producing a levitating gas for aircraft as good as, if not better than, hydrogen, but without its inflammable and explosive qualities, and which might be commercially efficient as well. I became first impressed with the possibilities of aeronautics at Chicago in 1893, and as I observed balloons the desirability of a safe and inexpensive gas seemed to be more and more important as an essential in effecting practical travel through the air. I studied over this a great deal, and my liking for chemistry and bacteriology probably led me to consider the problem more from the laboratory viewpoint than as a ballonist. At any rate, I began to reason the matter out and, as soon as I could, to make experiments.

Atomic Activity and Organic Changes

These were interesting, but not profitable and not always exactly safe. I had several "blow-ups" in getting acquainted with the qualities of hydrogen, but they strengthened my belief that a safer gas must be found. Finally, after some years of trying to get at elementals, I began to appreciate certain fundamental principles regarding atomic activity and organic changes. Atomic weight and specific heat are inverse concomitants—as one increases the other concomitantly decreases. We know, too, that through all material differentiations from a condition of utmost diffusion, or ultimate attentuation, with the least definity of matter and its motions to its greatest concentration, density and definiteness of motion, progressions which involve a state of gasefaction, of liquifaction, and even down to the state of greatest solidification of matter, accompanied, I believe, by increasing radiation of energy, both in amount and kind, there is an inexorable tendency to invest the greatest quantity of atomic matter, of the highest heterogeneity and of the least relative volumetric proportions, with the greatest amount of contained energy of paralleled heterogeneity. As we ascend the incline of organic developments, the higher we go the greater we find the demand for, and the greater are the quantitative absorption and redistribution of, radial forces of increasing heterogeneous wavelengths, amplitudes and intensities. All tend, as I have said, toward the endowment of the least quantity of matter of highest quality, universally and advolutionarily, with the greatest amount of contained and radiant energy having the least amount of heat-generating effect on surrounding and adjoining matter.

Is Hydrogen the Lightest Gas?

We cannot say finally that hydrogen is the lightest gas, although we have said that it is the lightest and terrestially identified gas. When light from our chomosphere is spectroheliographically analyzed the existence of gases or elements lighter than hydrogen is revealed, while the spectroscopical analysis of light from some stellar formations yields similar, or even more decided, manifestations in this direction. This would indicate to us that elementary formations and their atomic weights—no two of

which are the same—are varied to infinity and beyond the conception of our minds.

In my investigations I found that the atomic valency may be varied, and also that the affinity of one given element for another given element may be increased or decreased or even totally destroyed. I found, too, that elecricity is the primary cause of all material differentiations and that heat is the secondary cause; also that when such differentiations occur, as, and when the electrical and thermal conditions appertaining to matter conjoin, regardless of whether such conjunction may be naturally or artificially induced, at various stages of motion, phases of progression or states of heterogeneity, a transformation of the element is accomplished. This transformation may be said to be permanent until the contained electrical and remaining radial energy conjoin to induce other corresponding transformation.

By a method developed from these research results I have been able to vary atomic valency and produce a gas which is load-lifting or levitating and which is without dangerous inflammable and explosive qualities of hydrogen. It is commercially producible, which is equally as important a consideration as to make it dependable. At present I am justified in asserting that this gas is fully as serviceable and as cheap as hydrogen, with added qualities of practical value, but I feel that the process by which I produce it may make even a lighter gas. It will be feasible so to vary atomic weights that a gas may be produced of even greater lift—how far we may ultimately go in this I hesitate to conjecture. Hydrogen may be harnessable under certain circumstances, and it is obtainable in unlimited quantities at an economical rate, but it will not be considered safe enough to secure public confidence. Helium is difficult to produce with commercial efficiency, and it cannot be produced in all parts of the world; under present production methods, there is a limited supply which is restricted to the United States. There is a great need for a gas as safe as helium, but with greater buoyancy and producible anywhere at a cheap rate.

Formula Still a Secret

It will be readily seen that I cannot give the formula for producing this gas at present, for it is not fully protected. The demonstrations, chemically made, which have been made thus far are not as satisfactory as will be the case when a complete production plant can be made available—a situation, which I hope will be realized before the end of 1922. It should be possible, however, from what I have outlined, to note the manner in which this gas is produced. Machinery in large part already obtainable can be used in production, but the process will not be so expensive as that involved in securing helium. The materials required may be made available in any part of the world at an expensive rate. Electric power will be necessary for production on an economical basis.—*Aviation,* 22 May, 1922.

The Flight around the World.—Major Wilfred Blake and Captain Norman Macmillan set forth on their historic around-the-world flight on May 24. The Aircraft Disposal company has, with commendable sporting spirit, placed four machines at their disposal, and the project appears to give fair promise of success. The machines to be used, although not of new types, have stood the test of time, and, given reasonable luck, the aviators should have a very good chance of getting through. Although as a sporting effort the use of a single machine for the entire flight would have been more spectacular, the employment of four machines, of three different types, will be a much closer representation of the actual conditions which will obtain when we come to run really long-distance serv-

ices, and from that point of view is, perhaps, of even greater practical value.

Two of the machines will be DH9's (three-seaters) with Siddeley "Puma" engines. One will be a Fairey twin-float seaplane of the famous F. III type, which has a Rolls-Royce "Eagle" engine, and the fourth will be a flying boat of the F type.

In the main, the route to be followed by Major Blake and Captain Macmillan will be the same as that planned by Sir Ross Smith. The last "leg," however, will be different from that planned by Sir Ross Smith, who, it will be remembered, had intended to make the Atlantic crossing direct from Newfoundland to Ireland if possible, or, as an alternative, fly from Newfoundland to London *via* the Azores and Portugal. Major Blake and Captain Macmillan intend to follow the northern route *via* Greenland, Iceland, the Faroe Islands and Scotland, which will considerably shorten the non-stop stages that have to be negotiated. At the time of year when it is expected to cover this part of the flight the weather in the northern latitudes should be favorable, except for local fogs, and by taking this route the strain on the engines should be considerably reduced.

The manner in which it is intended to use the various machines is as follows: One of the DH9's will be used for the journey from London to Calcutta. Here the aviators will change over to *Fairey F. III* seaplane, which will take them around the coast up to Kamchatka and across to Alaska. Here another DH9 will await them, on which the flight across Canada and America to New York will be accomplished. From New York or Newfoundland the last stage, across the northern part of the Atlantic, will be attempted in the F boat.

This, in very brief outline, is the plan of Major Blake and Captain Macmillan, and, barring unforeseen accidents, the scheme promises success. That difficulties will be met and obstacles have to be overcome goes without saying, but there is certainly a very good chance of getting through. All the machines to be used, although of fairly old type, have been proved by years of flying under all sorts of conditions, and should be capable of the stages on which each is being used. The engines also have proved themselves in numerous long-distance flights, and may be expected to uphold the reputation already established. Captain Macmillan is one of our best pilots, and has had experience of a number of different types of machines.

Altogether, the scheme looks promising, and we wish the gallant aviators every success in their very sporting attempt.—*Aerial Age Weekly*, 5 June, 1922.

AIRSHIPS AS AIRPLANE CARRIERS.—In the early days of aeronautical development it was repeatedly suggested to combine the features of airships and airplanes in a composite type which would, in theory at any rate, partake of the advantages of both types and have none of their respective shortcomings. The airship can carry heavy loads over great distances at moderate speeds; the airplane, on the other hand, can carry relatively small loads over rather short distances at the highest speed any vehicle is capable of attaining. Hence it was but natural that attempts should have been made in the past to combine the two types.

The difficulty in doing this has been that in combining the advantages the drawbacks, too, were combined, with no real improvement on either of the fundamental types, because their characteristics were so widely divergent.

By constructing an airship to carry airplanes as separate units, there would seem to be a much better chance of success. In this case each type would retain its technical individuality, and can thus be efficiently designed for its own sphere of work. The idea of the carrier airship is

fundamentally sound, but it involves the solution of some important problems before it can become a reality.

The mechanical details of releasing airplanes from aboard airships, although presenting some novel engineering problems, need not offer serious difficulties. The one really important problem is that of ballast. Many persons apparently assume that weight can be unloaded and loaded on an airship as easily as on a steamship. But a steamship automatically displaces its own weight of water because it floats on the surface, whereas an airship is entirely immersed in the fluid in which it floats. In the latter case there are only three possible methods of maintaining vertical equilibrium, namely: changing the load (as by ballast); changing the temperature, pressure or quantity of gas; and using aerodynamic reactions.

The last method alone is usually ample for taking care of ordinary changes in weight or buoyancy except that due to fuel consumption on a long trip It is mainly for this latter purpose that various ballast recovery systems are being developed. But all present methods seem to break down when analyzed with respect to counterbalancing the release of a whole squadron of airplanes at once. The *release* can, of course, be handled by letting out gas, but this precludes the possibility of taking the machines on again, because there is no feasible method known of storing or generating gas on board.

But why take the planes on and off at all except for refuelling, repairs and other special purposes? The carrier airship would then be not so much a carrier of airplanes as of fuel, tools, spare parts, ammunition and relief pilots. Such an airship could carry supplies for about five times as many airplanes as it could actually accommodate on board.

For naval purposes a further development suggests itself. If the combination of airplanes and airships is good, that of airplanes, airships *and steamships* should still be better. The steamship is unquestionably the most efficient and economical unit for the mere transporting of loads. But the airship furnishes a more mobile and satisfactory base for many tactical operations.

The airplanes must, of course, do most of the actual fighting, reporting back at frequent intervals to the airship, which in turn will have no trouble in replenishing itself occasionally from the steamship. In fact there may be several airships, each with its airplanes, operating from the one steamship.

The term "aircraft carrier" then broadens in scope to ships of the air as well as ships of the sea. While much of the work along such lines is hidden behind the veil of official reticence, a general discussion of its feasibility should only stimulate activity in both lighter-than-air and heavier-than-air development.—*Aviation,* 15 May, 1922.

ENGINEERING

NAVY ENGINEERING SAVES LARGE SUMS.—The following paper, issued by the bureau of engineering, navy department, ought to furnish food for thought for those persons who accuse the navy of wasting money at times:

Engineering in the navy is so important a function in fitting the navy to perform its mission—its part so closely linked to all other successful naval endeavor—that it appears desirable at this particular time to advise all officers eligible to perform engineering duty of their responsibilities and opportunities.

The hard work of the officers and men afloat that is achieving self-maintenance for the navy does not pass unnoticed, nor does it merely save money. This labor has made possible certain definite improvements in the fleet machinery, and will make possible further improvements so that we have reason to hope for a fleet that is fit and ready for any service.

In October, 1921, notice was received by this bureau that the rate of expenditure of funds during the current fiscal year was in excess of the limit fixed by available naval appropriations. On May 1 an indicated deficit that six months ago was $700,000 had been wiped out and there had become available nearly one million dollars for the purchase of improved engineering materials for the fleet. This million dollars' worth of material is being purchased without creating a deficit.

The expenditures of the fleet for cleaning gear have doubled; at the same time expenditures for lubricating oil, fire brick and packing have decreased so much that the total expenditures for supplies afloat are now about $150,000 a month less than they were a year ago. The indirect saving from cleanliness is obvious.

Where Money Is Saved

For every dollar's worth of material that is worked into a ship by the ship's force, or by the fleet repair force, the charge against the "engineering" appropriation is exactly the cost of the material; when a similar amount of material is worked into the vessel at a navy yard the average cost exceeds $3.50. Thus every time that the fleet has accomplished self-maintenance the cost of this maintenance has been reduced to less than 30 per cent of what it would have been had it been necessary for the work to be accomplished by a navy yard. As a direct result of the success of the fleet in accomplishing self-maintenance and in leaving unnecessary work undone, this bureau has been enabled to institute the following definite improvements to the machinery of the fleet that would otherwise have been left undone for lack of funds:

(a) To purchase new distilling plant of low pressure type which will result in increased capacity and decreased cost of operation. (Fourteen ships.)

(b) To purchase oil purifiers for clearing fuel oil used under the boilers; this will result in more satisfactory oil burning due to less frequent plugging of atomizers, in more reliable operation due to keeping water out of the oil, and in a reduction of the amount of cleaning necessary in the fuel tanks. (Ten ships.)

(c) To purchase electric driven feed pumps for port use, which will increase the economy and reliability of port operation. (Sixteen ships.)

(d) To purchase electric driven fuel oil service pumps for port use, which will increase the economy and reliability of port operation. (Ten ships.)

(e) To modify on all ships all auxiliary turbine exhaust valves to prevent excessive pressures on turbine casings.

(f) To provide additional safe-guards against fuel oil fires by supplying additional distant-controlled valves on all oil-burning ships.

(g) To provide for installing new blower supports for all Terry turbine-driven blowers on destroyers equipped with this type of blower.

(h) To provide fleet tugs with turbine-driven blowers.

(i) To provide retarter for all ships equipped with oil-burning Scotch boilers.

(j) To provide experimental dampers to eliminate vibration in the engines of *S-3* to *S-9*.

(k) To provide improved mufflers for *S-3* to *S-9*.

(l) To provide all submarines with fuel oil meters.

(m) To provide 100-watt "AC" tube set, navy model T.M. These sets are for submarines and increase the range of communication from three to five times. (Sixty ships.)

Radio Stations Improved

In additional to the foregoing considerable improvements to the fleet that the fleet itself has earned and paid for, this bureau has been able to institute improvements to shore radio stations required for communication with the fleet amounting to $143,420.

Among these items are:

(a) To provide special high voltage generator for Anacostia. This is for development work to keep navy to the forefront.

(b) To provide two K. W. 2,000-cycle oscillator for sound research work.

(c) To install radio telephone at Arlington, Va.

The intense competition in fuel economy has had a direct result upon the condition of the machinery of the fleet due to exact operation and careful supervision. This means not only lower costs of upkeep, but greater readiness for service and is another direct dividend to the fleet from its own work.

The future holds much opportunity for further improvements. This improvement can only be made if past performance as regards cost are bettered. At present the fleet is doing better than it has done, but the goal of a machinery plant's entire readiness for any service is very distant. There are now in sight improvements to the machinery of vessels of the fleet that it would cost $16,000,000 to accomplish at navy yards. Until all these improvements (repairs, alterations and additions) have been accomplished our fleet's machinery is not entirely fit and ready for service. If they are accomplished we may expect the port fuel consumption of battleships to average below eight tons, of destroyers below 500 gallons and the fleet radius of action to be increased 50 per cent.

Appropriations Pared Down

The appropriations for the coming year are based upon exact necessities without allowance for improvements, but they are based also upon past performances. Improvements, therefore, in costs of supplies, repairs and operation, all of which depend upon economy and self-maintenance afloat, will make possible in the future, as they have in the past, continued progress in the development of the machinery of the fleet.

Increase in the radius of action of the fleet can be expected only from improvement in the skill, training and zeal of the personnel afloat. Success in this endeavor must be achieved before improved machinery can be paid for. The time will come as a result of the present laudable spirit of service when we will have our fleet's machinery economical, reliable and ready. Every gallon of fuel saved, *i. e.,* not wasted, will contribute towards the fleet's spending more hours underway and hence being more thoroughly trained in maneuvers and gunnery exercises. The value of our navy, in which nearly all operation is secured through machinery, depends, therefore, upon engineering skill, steadily and zealously applied.

The true engineer will always avoid waste and will prevent this waste, so far as practicable, with available means. It makes no difference what the form of the waste. Waste today in any form is not merely an offense against the taxpayer—it limits the possibilities of naval improvement.

Test for the Navy

The present stringency of funds is a test from which the navy must emerge a stronger, hardier and worthier service. Today the honor of the service is more completely in the hands of the naval engineers than in those of any other equal body of men. The lessons learned and the strength acquired through necessity will never be lost.

The officer of the navy is a servant of the Government. He delights in this service and proudly wears its livery, the naval uniform. A dis-

tinguished naval officer of high rank, now on the retired list, recently wrote: "I have known among naval officers, we all have, many high peaks of loyalty and forgetfulness of self in the giving of energy and ability to the service. It is an inspiration to live with fine characters of that sort. They simply go ahead doing their duty without thought of reward or of possible effects of overwork. The idea of devotion to duty as the measure of worth, of worth as the measure of happiness, and of service as the proper aim of each of us, I believe to be true, absolutely. Particularly do I believe that lasting happiness is found only through the medium of unselfish service. The thought of self in service, no matter how big the service, runs counter to nature's laws of compensation. Self-glorification and contentment of spirit are not found on the same trail.

J. K. ROBINSON,
Engineer-in-Chief, U. S. Navy,
Chief of Bureau.

Endorsement

Approved.

The secretary of the navy takes this occasion to congratulate the service on the close co-operation and application to technical efficiency which, as set forth in the attached paper, has directly resulted in making available nearly one million dollars for the purchase of improved engineering material.

It is extremely gratifying to note that the indomitable "will to win" is paramount in the heart of the American naval officer and man, and that obstacles offer but an added incentive for harder work and greater gain.

It is to be hoped that this proof of the dependence of naval readiness for service upon efficient and economical engineering practices in the fleet will inspire the personnel of the navy to maintain the present high standards and to improve them wherever possible.

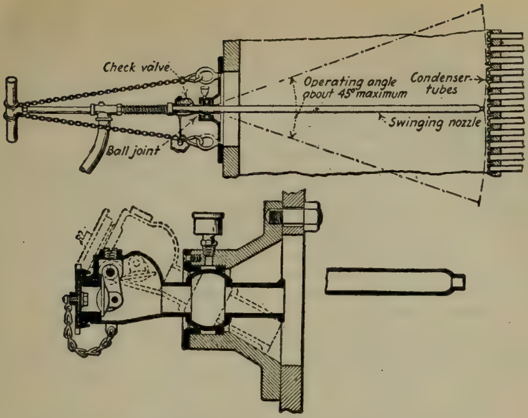
EDWIN DENBY.—*Army and Navy Journal,* 3 June, 1922.

WORTHINGTON CONDENSER-TUBE WASHER.—To meet the need for cleaning out the tubes of surface condensers as often as desired without interfering with their operation, the Worthington Pump and Machinery Corporation, 115 Broadway, New York City, has developed a tube washer consisting of a long water nozzle, or lance, which, after the necessary attachments have been made, may be inserted into the condenser through the different manhole plates and swung around each time so as to force a rapid stream of water through every tube in the condenser.

A section of the condenser with the apparatus in place is shown in the illustration, at the top, and at the bottom is shown one of the attachments that is placed upon each of the manhole plates. This attachment consists of a socket that swivels upon a ball-and-socket joint and through which the lance is inserted with a fairly close sliding fit. The shape of the end of the nozzle is shown at the lower right.

To use the device the operator pushes the long water nozzle into one of the attachments until he can hitch the four chains into the eye-bolts, as shown in the illustration. A spring between the attachment and the connection of the hose to the lance keeps the chains taut and the nozzle in its correct position, with its end very close to the ends of the condenser tubes.

The outer end of the lance is then swung around this way and that so as to force a stream of water (about 60 gallons per minute, 250 pounds pressure) through the different tubes, one after another. The nozzle end does not move in arcs, but is made to move more nearly in a plane surface by the action of the four chains; when the outer end of the pipe is pulled over to one side the chain attached to the eye-bolt on the opposite



A Washer That Cleans Condenser Tubes Under Full Vacuum

The water-jet tube is inserted through attachments in the different manhole plates and swiveled about so as to force a stream of water through each tube in succession.

side pulls it through the socket a little way and so tends to keep the nozzle end fairly close to the tubes.

When the tubes in front of one manhole plate have been cleaned, the lance is withdrawn, and the water in the condenser is prevented from escaping by a check valve shown in the closed position at the bottom of the illustration. A cap on the end of a short chain is then screwed on to make sure that the joint will be tight.

The operation is repeated for each manhole, and the manufacturers claim that about five minutes' work in each position is enough to clean the tubes in front of each plate. Best results, it is said, are obtained when the tubes are washed out daily and when the direction of flow of the washing jet is the same as the flow of circulating water. The apparatus is designed so that it can be attached to the manhole plates or flatheads of condensers already installed.—*Power,* 9 May, 1922.

Vacuum Type of Evaporator Being Extensively Used on German Ships.—In the operation of steam boiler and engine plants on board of ships there is an unavoidable loss of steam and water during the process of their circulation from the boiler to the engine, through the condenser and the feed water pump back to the boiler. Several years ago these losses were balanced by adding new fresh water from the feed water tanks in the double bottoms, although feed water generators were installed on all steamships. These, however, were only used in cases of emergency when the water from the tanks had been consumed or had become mixed with sea water through leakages. Therefore the economical operation of evaporators was of minor importance.

With the development of the modern steam plant, the introduction of geared turbines and water tube boilers it became necessary for feed water

to be absolutely pure, with the result that the use of evaporated water solely became a necessity and new and economic evaporators had to be devised. The desired end was accomplished by means of the three stage system of evaporation, but the apparatus proved to be troublesome in operation, and the cleaning of the tubes had to be frequent, a process requiring a great deal of labor. To overcome these disadvantages German inventors have perfected the vacuum type of evaporators, and these are now being used extensively on German ships.

The vacuum evaporator is heated either by fuel gases in the smokestack or by the cooling gases of the condenser, thereby avoiding all heat losses in connection with the process. The tank in which the sea water is contained is connected to the vacuum of the condenser by a one-inch or an inch and a half pipe with the result that the vacuum above the sea water is about 90 per cent. Under these conditions the water is evaporated at about 113 degrees Fahrenheit, the heating being accomplished by means of coils around which the smokestack gases are led or through which the condenser cooling water runs according to the type in use. The type utilizing the condenser cooling water has proved to be the most successful on account of its lighter weight.

Steam generated in this manner cannot be used for pre-heating, the boiler feed water being too cold for this purpose; neither can it be used for driving the low pressure part of geared turbines. Both of these processes, however, can be carried out by the steam evaporated in the super-pressure evaporators. It is the general practice to drive the auxiliary engines independently, and their waste steam is more than sufficient for pre-heating the boiler feed water, thus rendering heat from the evaporator unnecessary for this purpose. On the other hand the power which can be drawn from the steam of super-pressure evaporators in low pressure turbines is very small, and is more than counterbalanced by the loss of heat involved in the use of steam for the evaporator.

One of the main advantages of the vacuum steam generator is the fact that it works automatically and requires very little watching. Engineers on freighters do not generally favor steam generating from evaporators because of the work involved and because they prefer to rely upon the feed water in the double bottoms. They contend that they must have enough feed water to enable the ship to reach the next harbor, for an evaporator might break down. Therefore they are inclined to regard the evaporator merely as an apparatus to be used only in case of need. Vacuum evaporators, however, have proved their efficiency on freighters. They are operated in harbor by being made to consume the heat of the condenser into which the waste steam from the winches is led. In most cases sufficient water can be procured in this manner to take the ship to the next port; if not, the process can easily be continued for a short time at sea.

The quantity of feed water necessary to make up the losses in the boiler and the engine is not very large: in the case of freighters equipped with reciprocating engines the quantity is about 2 tons per 1,000 horsepower per day, for combination freight and passenger vessels about 2.5 tons and for passenger liners about 2.8 tons. The amount required for turbine plants, which use less steam, is correspondingly smaller.

In the case of the larger passenger liners with high engine power it is uneconomical to carry feed water for the entire trip in the double bottoms, as this would involve a considerable loss of deadweight capacity. It would be much cheaper for such vessels to carry vacuum steam generators of ample size, and reserve generators of the same or another type for use in the event of a breakdown of the main generator. The use of these evaporators has shown that feed water can be procured more cheaply than in harbors, and moreover, the water has the advantage of being free from impurities and gases, a factor of the highest importance

to the efficiency of the boiler, especially on oil-burning ships.—*Nautical Gazette,* 13 May, 1922.

MANŒUVRING OF SHIPS.—This paper deals with the research on this subject which is being carried out by the authors at the National Physical Laboratory. The research is intended ultimately to cover various types of ship and rudder. The work so far completed has been confined to the tests of "unbalanced" or "ordinary" rudders, either in open water behind a flat plate, or behind an ordinary ship model having a single screw propeller, at load draught, the ship being of the type capable of working at about 10 to 12 knots on 400 feet length.

Three rudders, *B, C* and *D*, of the same immersed area but of different outline (see Fig. 1) have been tested both in open water behind a thin fore-and-aft flat plate and in the ordinary position behind the rudder-post of a model fitted with a single screw. A fourth rudder, *A*, was also tested, this differing from *D* in being 21.2 per cent longer. A fifth one, marked *E*, was also tested behind the fin plate to obtain exaggerated surface effect. This had the same area as *B, C* and *D*.

The experiments have shown:

(1) Under *similar* conditions the torques on the stock of an ordinary unbalanced rudder vary as the square of the speed, and the dissimilar

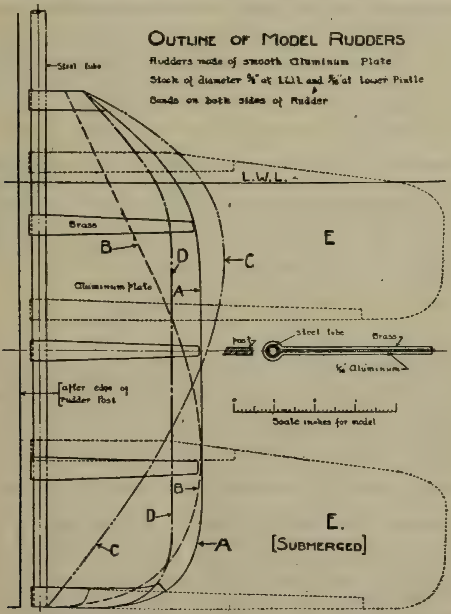


FIG. 1.

conditions represented by varying speed of any ship can only be met by means of a coefficient determined by experiment. The results obtained on a model at any speed can be applied to a ship at the corresponding speed by assuming that the torque varies as the product $A\ V^2\ l$, where A is the area of the rudder, V is the speed, and l the mean length of the rudder measured from the centre-line of the stock.

(2) Change in shape of rudder keeping the area constant had very little effect on its "ship turning-moment," but as the least moment on the rudder-stock was obtained with a rudder of normal type this appears to be the best shape for vessels of the type tested. Increasing area of rudder increases the ship turning-moment, but to a smaller extent than the increase in area. The torque on the stock increases directly as the product of area and length of rudder, so that a deep rudder is better than a long one.

(3) The forward movement of the water at the stern in a vessel of .78 prismatic coefficient reduced the torques and pressures on the rudder in open water by 50 per cent; but with the propeller working in front of it, at a normal true slip of about 40 per cent (7 per cent taken on the ship's speed), the torques and pressures are increased by a little more than this amount, so that actually the torques exceed those in open water without screw by a slight amount. There is a little movement of the centre of pressure with the propeller working, accounting for about 10 per cent variation in torque.

(4) The effect of the propeller race on the ship turning-moment is considerable. This moment with propeller was 1.85 times that without it. The rate at which the model turned off its course under helm with propeller working was roughly 1.3 times as great as without it working.

(5) The effect on the rudder torques and pressures of the propeller aperture in the deadwood was small in this case, varying from 10 to 4 per cent.

(6) Experiments with the model free, yawing under helm, supported the general conclusions formed from the other experimental work.

(7) For estimating pressures on rudders of normal unbalanced type behind the ship with screw working a formula is proposed in the usual *form* $P=kAV$, where A is area of rudder in sq. ft., V is speed of ship in ft. per second, and P is pressure in lb. The values of k as determined for two of the normal shape rudders, A and D, are:

Angle, degrees	10	15	20	30	35
Rudder A	.45	.66	.84	1.1	1.24
Rudder D	.45	.61	.75	1.0	1.13

As regards application to other forms, the value of the speed index would not necessarily be 2 in all cases, but for this particular class of ship it may be assumed that, although the index may be a little wrong in any special case, provided it is associated with the k values given, the calculated pressure will not be much in error.

As regards centre of pressure the experiments show that for all rudders tested the ratio $\frac{x}{l}$ with screw working behind the ship is .34 at an angle of 10 degrees, increasing gradually to .46 at an angle of 35 degrees, l being the mean length of rudder and x the distance to the centre of pressure, both measured from the centre line of the stock.

As regards effect of immersion, the ordinary rudders gave better results at all usual angles than type E, owing to their better aspect ratio. Even when E is at the surface and its equivalent aspect ratio doubled, although much better than when submerged, it is still worse than the others. This rudder shows best at large angles when fully submerged,

and worst at the surface at high speeds, when the speed for maximum wave-making has been passed.

(8) A few experiments made with the screw backing, the model moving ahead, showed that the torque on the stock was much smaller than for normal conditions; but with the model moving stern first, with or without the screw backing, the torques on the stock were higher than for normal ahead conditions at the same speed, the increase varying from over 100 per cent at small angles to a few per cent at 40 degrees of helm; but allowing for the difference between practical ahead and astern speeds, the greatest torque on the stock is developed going ahead with large helm.—*The Shipbuilder,* Annual Number, 1922.

ALCOHOL FOR INTERNAL COMBUSTION ENGINES.—It was decided by the Empire Motor Fuels committee that a comprehensive and complete scientific investigation should be made of the behavior of alcohol in internal combustion engines, and that a complete range of experiments should be carried out with 95 volumes per cent alcohol, as this was the strongest alcohol produced in commerce by the patent still. Through the kindness of the Anglo-Asiatic Petroleum company the committee was allowed to make use of the Ricardo variable compression engine which had been designed and built for that company. The Government authorities gave permission for the experiments to be carried out with pure alcohol, so that there should be no difficulties introduced in this fundamental work by the presence of denaturants. In these and all other tests the committee has readily obtained the willing co-operation of the Government departments concerned.

The experiments which it was decided to carry out with 95 volumes per cent alcohol were divided into four series:

Series 1.—Tests for power output and consumption over the complete available range of mixture strength with open throttle at four different piston speeds from 800 ft. to 2000 ft. per minute, and at compression ratios of 3.8 to 1 and 7 to 1 with constant heat to the carburetor.

Series 2.—Tests of power and efficiency over complete range of mixture strength at 0.8, 0.6 and 0.4 of full load with piston speeds of 1200 ft. and 2000 ft. per minute and a compression ratio of 5 to 1, with constant heat to the carburetor:

Series 3.—Tests over complete range of mixture strength at piston speed 2,000 ft. per minute, compression ratio 5 to 1, constant heat to carburetor, but with the circulating water at the outlet varied from 30 degrees to 90 degrees Cent.

Series 4.—Tests over the complete range of mixture strength at 2000 ft. per minute piston speed, at a compression of 5 to 1, varying the heat input to the carburetor from nil to 2,000 watts.

This work has entailed many thousands of readings, but the results are of the greatest value.

It was found that at all speeds both with high and low compression the thermal efficiency obtained with alcohol was higher than that obtainable with petrol or benzol at any compression which could be employed with them. Even at the low compression of 3.8 to 1, the thermal efficiency with alcohol is substantially greater than that obtained with petrol under similar conditions. In both cases the efficiency is almost independent of speed. The heat delivered to the circulating water is less in proportion with alcohol than with petrol. It was further found that compared with petrol or benzol the thermal efficiency obtained with alcohol was equally high at high or low compression. The tendency to preignition began to be evident at 7 to 1 compression ratio.

Owing to the lower heat value of alcohol, the fuel consumption is much higher than is the case with petrol, in spite of the higher thermal

efficiency, if they are used at the same compression, but the fuel consumption can be reduced much further in the case of alcohol than in the case of petrol by increase of compression ratio. The throttle tests (Series 2) have shown that the behavior of alcohol and petrol under variations of throttle conditions was identical.

The influence of jacket water temperature was investigated (Series 3), and showed that the power output from the engine was slightly diminished with increasing jacket temperature. The efficiency also fell slightly, as is the case with all other volatile fuels investigated. The reputed increased power obtainable with alcohol engines with hot water jacket is probably much more due to the diminished piston friction in the warm cylinder than to any other cause.

The experiments in Series 4 have shown that the maximum output from the engine is obtained when no heat is supplied to the ingoing air, but the thermal efficiency is slightly increased with increase of heat to the carburetor.

It has been proved that under all conditions of compression speed or throttle alcohol-driven engines run more sweetly and more smoothly than when running on petrol. Detonation never occurred under any compression employed, but at 7 to 1 compression, corresponding to a pressure of 185 pounds per square inch, there was a tendency to pre-ignition; 6½ to 1 is probably the maximum compression to be aimed for.

There has been no evidence whatever of any corrosion of valves.

It must be remembered that these experiments have been carried out on a single-cylinder engine, and that in practice troubles and difficulties introduced by induction manifolds may render it desirable to sacrifice efficiency in some directions to gain flexibility and acceleration. Nevertheless, the series of experiments which have been carried out have led to the accumulation of the most valuable fundamental facts and figures which must be of the greatest value to the industry in the near future. It was decided by the committee that further experiments should be carried out on similar lines to those above referred to, but with alcohol at 99 and 90 volumes per cent strength. The results obtained with these fuels substantiated the earlier work and proved that the mean effective pressure increases as the water content is increased, so long as the whole of the fuel and water is completely evaporated before the end of the compression stroke. The power output was increased slightly even with the 90 volumes per cent alcohol. The behaviour of the varying amounts of water was studied over compression ranging from 3.8 to 1 to 7 to 1, and it was proved that the presence of water in all cases increases the maximum power output and reduces the heat flow through the cylinder walls. In high compression engines there is a substantial advantage in using alcohol containing a reasonable amount of water.

It has definitely been proved:

(1) that alcohol can be used from the low compression employed on paraffin engines up to a far higher compression that can be used on any petrol engine;

(2) that the thermal efficiency obtainable with alcohol is higher than with petrol or benzol;

(3) that under all conditions of throttle or mixture alcohol requires the spark more advanced than is the case with petrol or benzol, and much more advanced with weak mixtures;

(4) that there was no evidence at any piston speed attained in the engine that the rate of combustion of alcohol under the conditions obtaining was too slow to obtain the maximum effect;

(5) that detonation does not occur at compressions up to 8 to 1, and pre-ignition does not occur at 6 to 1, even when running for long periods at the highest possible power output of the engine;

(6) that there was no evidence whatever of corrosion in the engine;
(7) that the power output and efficiency are increased by low temperature of the circulating water;
(8) that supplying heat to the carburetor reduced the power output but slightly increases the thermal efficiency;
(9) that increase in the water content up to 10 volumes per cent is an advantage, particularly in very high compression engines.

A new series of experiments is now in hand with a view to investigating the influence of ether on alcohol, and the influence of alcohol on petrol, benzol, paraffin, and the like. It is believed that this work will prove of considerable value to the motor industry, as it is probable that the first introduction of alcohol on any scale as a motor fuel will be in the form of an admixture of it with other ingredients.—*The Engineer,* 12 May, 1922.

NON-CORRODIBLE IRON AND STEEL.—A paper of great importance to marine engineering, "Corrosion of Ferrous Metals," was read a short time ago before the Institution of Civil Engineers by Sir Robert Hadfield. In 1916 the institution formed a committee to study the corrosive action of sea water on structures in general, and Sir Robert Hadfield was consulted as to the best methods of investigating the results in connection with the ferrous metals. Acting upon his advice, 14 types of ferrous material, both iron and steel, were examined, the former consisting of wrought iron, Swedish charcoal iron, "Armco" iron, cold-blast cast iron, and hot-blast cast iron. The steel specimens selected were mild steel with low manganese and high sulphur and phosphorus content, mild steel with 0.7 per cent manganese, medium carbon steel with low sulphur and phosphorus, carbon steel with 0.4 per cent carbon, mild steel with 0.5 per cent copper, mild steel with 2 per cent copper, nickel steel with 3.5 per cent nickel, nickel steel with 36 per cent nickel, and rustless chromium steel (13½ per cent chromium). The committee fixed a standard size, 24 inches long, 3 inches wide, and ½ inch thick, for the samples, and in the course of the investigations, 1,330 separate specimens have been prepared, mostly in the "as rolled" condition, but in many cases also heat treated. An elaborate series of investigations as to the properties of 182 of the test pieces have been carried out in Sir Robert Hadfield's laboratory, including complete chemical analysis, Brinell hardness number, photomicrographs of longitudinal and transverse sections, tensile tests, and shock tests. Sets of the test bars are then to be immersed in the sea for a long period, at the end of which they will be examined in the same exhaustive manner to ascertain the extent of the corrosion and the difference caused in the various properties.

A remarkable feature of research work on alloys is the effect that even traces of one metal will have in altering the properties of the final alloy. Thus, for example, in connection with the corrosion of ferrous metals by sea water, the addition to steel of small amounts of copper causes a pronounced difference by increasing the resistance to corrosion, a fact for which there does not seem to be any adequate explanation.

Sufficient work has, however, been done of the subject of alloys in the last few years to warrant the expectation that we shall in the near future be able to produce non-corrosive iron, steel and other metals at a price capable of being used in bulk. It is difficult to realize what the corrosion of metals is costing the world, not only in damage and loss in the actual metal, but also in the continual costly painting that is necessary, and the shipping industry suffers more in this respect than any other.

Sir Robert Hadfield gives some arresting figures in his paper. It is estimated that the total steel production of the world from 1860 to 1920 has been 1,860,000,000 tons, of which about 660,000,000 tons have been

destroyed by rusting whilst actually in use. In the year 1920, for example, the loss throughout the world was about 29,000,000 tons, and, taking the value of steel as, say, £20 per ton, the total loss to the world, including all the money spent on paint-work or other protective devices, was about £700,000,000. If ships can be made of non-corrodible metal throughout, it will be a revolution in marine engineering, the beneficial effect of which it is difficult to realise.—*The Marine Engineer and Naval Architect,* May, 1922.

NAVIGATION AND RADIO

MAPS AND NAVIGATION METHODS. BY A. DUVAL.*—Before undertaking any voyage, however short, the aerial navigator provides himself with the necessary maps. This is an easy matter in our country, where there is a wide choice among the various maps published by the geographic section of the army, the department of the interior and the Aero Club.

When it is a question of a trip into a foreign country, the case is no longer the same. In some countries the only existing maps are incorrect or poorly edited, while in others they are comparable with ours, but French navigators, not being accustomed to their scales, nor to their colors, nor to their special manner of presentation, do not find them convenient. Reciprocally, foreigners experience the same inconvenience in using our maps. The most commonly used map is drawn on the scale of 1:200,000. This gives the most details of interest to the aviator, without taking too much paper. The 1:1,000,000 scale is useful for long voyages. It is always best to carry the corresponding maps on the 1:200,000 scale, for the aerial navigator sometimes has occasion to identify details not shown on the 1:1,000,000 map.

These two maps are not specially made for aviators. It seems therefore that the solution of the problem has progressed hardly any since Mr. Lallemand, member of the Institute, asked for the creation of aviation maps. This delay is explained by the fact that during the war the existing maps (1:200,000 of the geographic section of the army, and 1:126,720 of the ordnance survey) were satisfactory to the aviators of the Allies, who flew in restricted sectors and seldom made long voyages.

Now the requirements of civil aeronautics, the chief object of which is to make voyages, are different and depend on aviation maps. This fact did not escape the attention of the experts who drew up the international agreement of October 13, 1919, containing regulations for aerial navigation. Annex F, of this agreement or convention, made provision for various international aviation maps, which the contracting countries will publish within a few years. Already three of the most enterprising nations have agreed on the details of execution, as we shall see further along.

Anyway, it is not out of place to call attention to the scope of the task undertaken, as well as to the value of the preliminary work accomplished since 1919. If the aviators, who are wanting aviation maps worthy of the name, had any idea of the work accomplished, their very natural impatience would be less prompt to manifest itself.

Under the respective designations of normal maps and general maps, the convention established two types of international aviation maps. In principle, they must be made according to the rules adopted for the 1:1,000,000 map of the world, with the metric system of measurements. Each country, however, has the privilege to *add* its own units of measurement to the maps it publishes.

After discussion during the English-French-Belgian conferences of 1920 and 1921, the details of the conventional symbols were fixed. Since their exposition lies outside the scope of this article, we will confine ourselves to a general description of the two kinds of maps provided for.

* From *Premier Congrès International de la Navigation Aérienne* pp. 150-155, Paris, November, 1921.

General Maps.—The general map is made according to Mercator's projection, one degree of longitude being represented by a length of three centimeters, which gives, in our latitude, an average scale of about 1:2,000,000. Each folio contains a complete number of sections of the map of the world on the 1:1,000,000 scale, which is generally nine for latitudes below 60°, six and even three for higher latitudes. Each side of each sheet covers 1° in latitude by 2° in longitude. There is a common portion on adjacent sheets, which facilitates the passage from one sheet to the next.

The relief is indicated by hypsometric tints supplemented by altimetric figures and, where there is occasion for it, by a slight shading. This method of representing the relief is in conformity with the 1:1,000,000 map of the world. It enables the aviator to choose instantly, without risk, the altitude of safety, in case of poor visibility. Any representation of relief, accomplished simply by means of shading and altitude figures, does not offer this advantage, since the navigator must read all the altitudes of a region in order to determine the altitude of safety. He runs the risk of overlooking that of the summit, against which he is in danger of crashing. The necessity of judging the altitude of the whole region led to the use of hypsometric colors for the general map. It is omitted on the normal maps, where each section bears on its margin the altitude of the highest point and of the lowest point in the region represented. The relief of the normal map is also shown by shading.

Lastly, general maps are only provided for continents. Aviation maps are not necessary, in fact, for the oceans, for which the aeronaut will use marine maps based on Mercator's projection.

Normal Maps.—These are published on the scale of 1:200,000. The kind of projection is not stipulated. This is because, on the one hand, the various projections differ but little on this scale and because, on the other hand, of the great advantage of being able to make use of much existing cartographic material.

Each section of the normal map embraces 1° in longitude and 1° in latitude. They will doubtless overlap one another by several kilometers. The relief is indicated by shading, supplemented by altimetric figures.

Miscellaneous Maps.—The object of the convention was to create a set of identical aeronautic maps for the whole globe. Aside from these standard maps, the aerial navigator may use any others. Let us note, in passing, the 1:200,000 map of Capt. Hebrard and Lieut. Robbe, on which the roads stand out light against a dark background. The advantages of this method will be manifest, when night flights become common.

Maps are indispensable for the aviator. Their conception, however, depends on the methods employed in aerial navigation, which we will now endeavor to set forth.

"To navigate is to go from one point to another by the shortest and easiest route." This applies to both water and aircraft.

Aerial navigation, although freely accomplished in three dimensions (with certain restrictions in the vertical direction) is in all points comparable with maritime navigation. On the contrary, it is not comparable with the means of land transportation.

In fact, there are two methods of navigating an aircraft:

1. To fly with continuous reference to landmarks;[1]
2. To take a direct route by the compass, with only occasional reference to the ground for determining the position of the aircraft.

[1] Some authors make a distinction between following a continuous reference line (highway or railroad) and flying from one reference point to another by comparing the ground and the map. This is a distinction with a difference, since in cloudy weather they lead to the same result, flight near the ground.

The former method, which is chronologically older, is still commonly employed. Although comprehensible in the beginnings of aviation, when only the pilot was on board and the voyages were of short duration, it is now an anachronism. To be compelled to follow a railway or a river is a loss of time. This method is, moreover, not very safe, for as soon as the pilot loses this "thread of Ariadne," he is lost. Errors have been frequent at cross-roads and junctions. Lastly, it is well to note the danger resulting from this practice. On a given aerial route, all the pilots would follow, in cloudy weather, exactly the same landmarks, thus creating great risk of collisions.

The second method, successfully employed on aeroplanes and airships by several crews, has stood the test for centuries in all navies. It is therefore no novelty, but merely an adaptation. By means of the compass, the pilot steers the aircraft in a constant direction with reference to the meridian. The path thus described is a loxodromic or rhumb line.

Hence, to steer by the compass is to describe a loxodromic curve. The pilot only needs to choose the one which connects his starting point with his destination, and then to make sure from time to time that he has not departed from it and, lastly, to verify his speed.

The use of the compass renders it possible to follow the most direct route between two points and especially to lose sight of land without inconvenience, for a certain length of time. At any instant, the navigator can determine his position by "dead reckoning," with the aid of his absolute speed and the time elapsed.

The accuracy of this method depends on the pilot's skill in using his compass and on the exactness of his knowledge of the data employed, namely, the angle of the route followed and the absolute speed. The route angle is the angle formed with the meridian by the loxodromic trajectory described on the earth by the aircraft which is steered with the aid of the compass.

As often as possible, this dead reckoning will be verified by observations of terrestrial or celestial reference points, or other method (radiogoniometry, etc.).

Usually the wind causes the aeroplane to drift (uniformly, if the wind is regular). The angle between the axis of the aircraft called the course, and the route actually followed is the angle of drift. The pilot must therefore endeavor to determine the course to be adopted so that the drift will cause him to follow the loxodromic line traced on the map. Practically, for holding the aircraft on this course, the pilot must determine opposite what graduation of the compass rose he must hold the reference mark which indicates the position of the axis of the aeroplane. The compass course is obtained by correcting the given course by the angle of "variation." This variation is the algebraic sum of the magnetic declination (angle formed, at any given place, between the geographic and magnetic meridians) and the deflection caused by the iron of the aircraft, which affects the magnetized compass needle. The declination is always exactly known. As to the deflection, an endeavor should be made to eliminate this once for all by "compensation," the explanation of which lies outside the scope of the present article. It is a very simple and practical operation. When properly executed, the residual deflection is very small (1° to 2°) and the directive force of the compass remains constant for different courses.

The only difficulty encountered in following a loxodromic or rhumb line is therefore the determination of the angle of drift. By means of aerological soundings, this is easily determined before starting. The data for calculating the course then remain exact so long as the wind does not vary. If the wind is found to change, it becomes necessary to change the course steered or be driven off the true course. During the

voyage, the navigator must employ one of the two following methods for determining the drift.

1. Determination, on the map, of two successive positions of the aircraft and of the exact route followed between these positions.

2. Instantaneous measurement of the drift by the observation of some point on the earth.

The first method utilizes what some call "navigation by observation," in which the navigator steers by calculation, which he rectifies by every observation made. He thus describes a series of loxodromic lines each one starting from the last point observed.

The second method of measuring the drift necessitates a brief view of the earth, without its being necessary, however, to identify any given reference point. It consists in measuring the angle formed by the apparent motion of the reference point and the course of the aircraft. This measurement can be made, even when the reference point does not pass directly under the aircraft. The S. T. Ae. (Technical Section of Aeronautics) drift-meter and the Le Prieur "navigraph" are based on this principle. Moreover, the results are faithfully preserved, which constitutes a great advantage, since two successive drift measurements with different courses give the magnitude and direction of the wind.

The absolute speed is measured; either by noting the time taken to traverse the distance between two observed points, which are shown on the map; or instantaneously by making measurements with reference to a single point, which does not need to be identified.

For utilizing the latter method, we may employ the navigraph, the S.T.Ae. drift-meter, or the Le Prieur "cinemograph."

In the S.T.Ae. drift-meter, there are two sighting wires, adjustable in altitude, which intercept a base of 500 km. on the ground. The navigator sights a reference point and measures with a chronograph the time of passage from one wire to the other. An abacus gives the absolute speed in km/hr.

In the Le Prieur cinemograph, the sighting is done with the aid of a slide carrying a stylus which traces a line on a paper moving vertically with a uniform speed. These combined uniform motions give a straight line, the inclination of which is a function of the altitude and of the speed. The errors due to changes in the trim of the aircraft are eliminated by the fact of the graphic inscription.

In the navigraph, the absolute speed is obtained by the automatic production of the triangle of velocities, of which the sides "air speed" and "wind" are known, as also the angle of drift.

Observation Point.—This can be obtained by watching the ground. The navigator either identifies some reference point under him or determines his position with the aid of distant reference points.

When the ground is not visible, the observation point is found by observing the stars, according to methods similar to those employed at sea. Unfortunately, the mariner's sextant is not utilizable on aircraft and no other instrument has thus far afforded any practical solution of the problem. For want of an astronomical point, the aerial navigator can utilize radiogoniometry.

The preceding exposition shows that loxodromy is the basis of aerial navigation. The ideal map for aerial navigation is therefore the one on which all the loxodromes are represented by straight lines and their angles with the meridians. Only Mercator's projection will answer these requirements. Its use for general aeronautic maps is therefore fully justified.

As regards utilizable routes in aerial navigation, we have purposely omitted orthodromy (sailing on the arc of a great circle). The arc of a great circle is in fact the shortest way between any two points on the earth's surface and would therefore seem preferable to loxodromy. This

advantage is, however, only theoretical, since for all points less than 1,000 km. (622 miles) the difference between the orthodrome and loxodrome is negligible (about 1/300). Now the stops, the obligatory points for crossing frontiers, and natural obstacles impose an itinerary, whose sections rarely attain 1,000 km. These sections are therefore loxodromes.

There remains the employment of orthodromy on very long trips. Here again flight on the arc of a great cricle does not make good its promises. If the points of departure and arrival are on the same parallel of latitude, the vertex or culminating point of the curve is near the pole and hence climatic considerations prevent the utilization of the most important part of the ideal curve. If the points of departure and arrival are almost on the same meridian or near the equator, the orthodrome and loxodrome differ but little. It should be noted, moreover, that the only method for describing a great circle consists in resolving it into a series of successive loxodromes of about 1,000 km. which are followed by means of a compass.

The arc of a great circle therefore serves to determine an itinerary. There is no need of special maps for this purpose, since Mr. Favé, a member of the institute, has invented a rapid and simple method of tracing the arc of a great circle on a Mercator map. The employment of the Favé abacus enables the aerial navigator to determine instantly and accurately the points through which an arc of a great circle passes by simply moving over the map a transparent sheet on which is traced a whole series of curves representing the projection of various great circles whose vertices are on any given meridian.

In conclusion, we may say that, on the one hand, the question of aeronautic maps is progressive and is following its normal course; while, on the other hand, the empirical methods of aerial navigation thus far employed are retrogressive, slow and dangerous and should be replaced by scientific methods of navigation, based on loxodromy and the use of the compass.

(Translated by the national advisory committee for aeronautics.)—*Aerial Age Weekly,* 8 May, 1922.

WEIGHT INSTRUMENT FOR MEASURING OCEAN DEPTHS IS VERY RELIABLE. —Rapid development has been made in the methods of utilizing sound under water for ascertaining the depth of the ocean. One of the latest and most practical applications of the principle is embodied in an instrument known as the weight.

The action of this device is based on the theory that a solid body travels through water at a regular speed. It is an established fact that if a metal ball is dropped into the water from a height of approximately six yards above the surface of the water, it reaches the water at a speed of about ten yards per second. When the balls enters the water the speed is reduced, and when less than half a yard below the surface it assumes a steady speed which is maintained until the bottom of the ocean is reached.

The weight consists of a metal ball to which a small bomb is attached. The apparatus is thrown into the ocean and when the bottom is reached the bomb explodes. The sound of the explosion is received on board the vessel by the usual underwater sound receivers now installed on a large number of ships. The time from the instant the ball touches the surface of the water to the moment when the sound of the explosion is heard is measured by a stop-watch and the depth of the ocean calculated. For example, assume that the metal ball travels through the water at a rate of two yards per second, and the depth of water is twenty yards, ten seconds would elapse between the time the ball struck the water and the explosion is heard. It can readily be seen that the number of seconds thus recorded by the stop-watch multiplied by two will give the depth of the ocean in yards.

The great advantage of this apparatus is that it can be operated by the officer on the bridge without the aid of any member of the crew. Furthermore, it is not necessary to reduce the speed of the ship to take soundings unless the water is very deep.

In the use of the various instruments which are based on the principle of utilizing sound under water as a means of ascertaining the depth of the ocean it should be remembered that water as a sound conveyor does not always act in the same manner. It often happens that in sound expansion and sound limit, considerable fluctuations are to be recorded. These fluctuations are due to the difference in temperature between the water near the surface and the water at the bottom, and also to the varying percentage of salt in the ocean at different depths.—*Nautical Gazette*, 13 May, 1922.

SECRECY OF RADIO MESSAGES PROMISED BY JOHN H. HAMMOND, JR.—John Hays Hammond, Jr.,. apparently has revolutionized radio communication by a new invention. He has perfected a comparatively simple apparatus to prevent any station from taking messages except those for which it is intended.

The same wave can be made to carry several messages at the same time, and, further, it is stated, both voice and code may be transmitted.

The new apparatus will allow a far greater number of stations to communicate over a limited number of wavelengths. Accidental interference from other stations is greatly reduced. Efficiency is increased. Atmospheric electricity, or static, is diminished in its effect upon the new system to such extent that the system may be operated under conditions when the standard radio apparatus cannot successfully receive.

Mr. Hammond's statement declares that he has been at work upon these problems for the past fourteen years. A demonstration was given today before officials and experts of one of the leading American radio companies, and Mr. Hammond says the United States navy and war departments have given his latest discoveries exhaustive tests with success.

The system, it is declared, embodies a direct and simple means of insuring privacy, and it will be practically impossible under ordinary conditions for any other than the proper receiving station to hear anything but a jumble.

The treasury department was authorized in 1916 to set aside an appropriation of $750,000 to acquire the patent rights of John Hays Hammond, Jr., in order to have the exclusive use of his researches and inventions in the line of the radio dynamic control of torpedoes. Military authorities spent a large amount of time in furthering the idea until last summer, when the chief of the coast artillery, owing to the developments of bombing from aeroplanes, decided to recommend its abandonment.

It is stated that, because of the new device, the navy has asked the Senate sub-committee considering the army appropriation bill to strike out the requirement that the $750,000 appropriation made in 1916 to acquire the special rights of John Hays Hammond, Jr., be returned to the Treasury.—*Aerial Age Weekly*, 29 May, 1922.

RADIO TO JOIN FIVE COUNTRIES.—On returning from the International Radio Conference yesterday Edward J. Nally disclosed the fact that a new radio service that will link five nations together was one result of the gatherings in Cannes, Paris, and later in London.

The conferences were carried on under the auspices of the Commercial Radio International Committee, and this agreement has been made between representatives of companies of England, France, Germany, United States and South America.

The new circuit will be operated in New York, Paris, London, Berlin and Buenos Aires. Mr. Nally, who is the president of the Radio Corporation of America, came back on the steamship *Homeric* after several weeks abroad attending the conferences. He told *The Evening World* that many important questions affecting the development and operation of wireless were considered and satisfactorily settled; in particular, the questions dealing with the extension and development of world-wide telegraph and telephonic communication.

The first of these new international services will be in Argentina, where a super-powered station is now in course of construction and which will be completed soon. It will be located near Buenos Aires and will be capable of transmitting and receiving simultaneously with the stations to be erected in New York, Paris, London, and Berlin.

Another conference will be held by technical experts of committee in Berlin late in June to conclude the world-wide connection of other countries by wireless.

Mr. Nally said that the people in Europe are intensely interested in the development of the radiophone and broadcasting service in the United States. Owing to existing laws their many difficulties will have to be overcome by several of the governments before broadcasting is done on the same broad plane as in the United States.—*Aerial Age Weekly*, 22 May, 1922.

HIGH-POWER VACUUM TUBES.—In connection with Great Britain's imperial chain—a world-wide radio system that has been under way for a long time—the technical committee recommended the use of high-powered tube installations. A considerable amount of very valuable work has been carried out in the past year by the British admiralty, working in conjunction with the Mullard tube builders. Much progress has been made in the construction of silica tubes, which have now been made in ten-kilowatt sizes. The result of this work will undoubtedly be seen in the forthcoming year. We may expect a large number of land stations operating on valves of large power.—*Aerial Age Weekly*, 1 May, 1922.

ORDNANCE

PROJECTILE DIMENSION TOLERANCES.—For some time experiments have been under way under the auspices of the army ordnance department in connection with the effect of tolerances on projectile dimensions, with a view of securing increased accuracy and at the same time to keep the dimensions within limits that may reasonably be prescribed in manufacturing operations. If two projectiles are to range the same, they in general should have the same size, shape, and distribution of weight. To insure a reasonable degree of uniformity in this respect, tolerances are placed on the more important dimensions shown on projectile drawings. For example, in the case of a 155-mm. shell, the normal over-all length of the unfused projectile is 22.7 inches, and the tolerances on the drawing indicate that any shells that do not differ in this respect by more than 0.18 inch will be acceptable. Aside from dimensions affecting threads, there are shown on the drawing of this projectile tolerances on nine dimensions ranging in magnitude from plus or minus five-thousandths of an inch to eighteen hundredths of an inch. The larger the tolerances the cheaper it is to manufacture the shell, but, on the other hand, one would expect that the smaller they are the more accurate would be the ranging of the projectiles.

The problem of deciding exactly what these tolerances should be is one of the most important and difficult of the projectile designer. Until recently there have been almost no data available on which to base such a

decision, and consequently up to this time the magnitude of the tolerances has been governed almost entirely by precedent and tradition. At present, however, as a result of a 1,500-round range-firing program for the 155-mm. G. P. F. gun, which just has been completed, the ordnance department is in possession of a certain amount of information concerning the effect of changes in various dimensions on range, and for the first time it is able to base its decision in this regard on rational grounds.

The program is regarded, however, as merely a beginning, for the results obtained from it are applicable only to a projectile of a given size and shape when fired with a given muzzle velocity at a given elevation. To extend this program by range firings to cover the multitude of combinations of shapes, sizes, and muzzle velocities would involve an enormous expenditure of ammunition. Nevertheless, as a result of an extensive program of air-resistance firings now commencing, it is believed that useful data on the subject will be accumulated at much less expense.

There undoubtedly are some projectile shapes that are much more sensitive to slight changes in dimension than others. In its future design work the ordnance department proposes to make a study of the problem from this point of view, with the object of selecting those shapes that will permit the greatest tolerances on dimensions for a given effect on range.—*Army and Navy Register,* 20 May, 1922.

MISCELLANEOUS

REVOLUTIONARY CHANGE IMPENDING FROM STEAM-POWERED TO OIL-DRIVEN SHIPS.*—A revolution of a technical nature, whose political and economic effect on the future cannot be overestimated, is at present taking place in the world's shipping. During the last few years, extraordinary progress has been made in the substitution of oil fuel and oil-driven motors for steam power generated by coal. The revolution seems likely to be more far-reaching in its effects than the last great revolution in shipping, when sailing vessels were replaced by steamships.

War Hastened Change

When the war broke out oil-driven shipping was only in its infancy. Coal fuel was comparatively cheap and the fuel supply in all the seaports of the world was excellently regulated and secured. There seemed, therefore, no reason for abandoning coal fuel in favor of a fuel which had only been tried in minor and coastal vessels. The great and long enduring coal shortage of the war and post-war days, however, brought about a "flight from coal" to an extent and with a rapidity which ten years ago would have been deemed impossible.

Just as the war gave a new impetus to sailing ships and their construction so, too, to an incomparably greater extent oil-driven shipping was encouraged by the coal shortage and the high price of coal. As matters stand today, the steamship, as compared with large vessels driven by oil fuel or oil motors, appears, all things being equal, old-fashioned and is likely to be regarded in the near future as out of date. Comparative statistics obtained in 1921 show to a surprising extent that oil fuel is marching forward victoriously, rapidly and unceasingly, and that coal fuel is losing in importance with unexpected rapidity, especially as, from an economic standpoint, coal fuel is far inferior to oil.

The extent to which coal is being replaced by oil can be gauged from the fact that there were 2,336 oil fuel burning, seagoing vessels of 12,800,000 gross tons in 1920 as against 364 such ships of 1,300,000 tons in 1915.

* Extracts from an article appearing in the *Technik und Wirtschaft* as summarized by *The Economic Review.*

The use of oil for driving Diesel motors, which is a far more economical method of using oil fuel, has not as yet attained great dimensions, and as far as ocean-going vessels are concerned, is in its early stages. But in a few years' time it may well have surpassed in importance the employment of oil for firing. To show the significance of the Diesel motor for existing and future marine shipping, the following figures may be given.

The first practicable Diesel motor was produced in Augsburg, in 1897, and the first motor for driving a ship in Winterthur in 1903. It was only one year before the death of its inventor in 1913 that the Diesel motor was first used for an ocean-going vessel, for in 1912 the Hamburg-American line launched the *Monte Penedo,* a vessel of 6,500 gross tons, with a 1,000 h.p. motor on board. About the same time, at the end of 1911, 40 oil-driven ships were under construction in English yards. What first definitely turned the scale, however, was the experience gained by the Danish twin-screw motor vessel *Selandia,* built for the Danish-East Asiatic Co., which made its trial trip in 1912. This was a vessel of 3,200 net tons, with a cargo capacity of 7,400 tons and fitted with a 1,250-h.p. motor. With a full cargo of oil, which she carried in a double bottom, she attained a speed of 11 knots, and with a cargo of 900 tons a speed of 13.35 knots. As compared with a steamship of equal size, whose heavy machinery and coal bunkers she lacked, she showed a clear gain of no less than 1,000 tons of cargo space.

One-Quarter Oil-Driven

In 1921 the world's motor fleet consisted of 1,475 vessels of 1,244,418 gross tons. To these motor ships should be added the 12,800,000 tons of cargo space in vessels which today use oil fuel. Accordingly oil shipping today comprises over 14,000,000 tons or nearly one-quarter of the world's total tonnage which on June 30 last amounted to 61,974,653 gross tons.

The price of motor fuel is, it is true, considerably higher than that of coal but that is a secondary matter in view of the great advantage over coal fuel offered by oil fuel and oil motors. The removal of the heavy machinery and the coal makes possible a saving on an average of about 55 per cent of the available cargo space. The more complete using up of the thermal unit in the case of an oil motor compensates to a great extent for the increased cost of the fuel unit. Recent observations show that in the case of a 10,000-ton Swedish vessel, which formerly used coal but now uses oil, 70 tons of oil were equal in efficiency to 220 tons of coal, and, moreover, it was found possible on a ten days' trip to increase the cargo formerly carried by 1,400 tons.

A further notable experience is that made recently by the 13,000-ton oil steamer *Java,* of the Danish-East Asiatic company, which on the Copenhagen-Suez-Capetown-Copenhagen trip, only had to refill her oil tanks once, while her Diesel motors showed a saving of the weight of 80 per cent as compared with a ship employing steam pistons and of 25 per cent as compared with a vessel using steam turbines. According to the latest observations the total working cost of the three methods of ship propulsion shows the following proportion:

Coal fuel	4
Oil fuel	2.5
Motors	1

This gives a very clear picture of the superiority of oil over coal as fuel, and the still greater superiority of Diesel motors.

There is, in addition, a considerable saving in personnel, which is a result of the simplified and much cleaner working, and which is doubly important at the moment when wages are so high.

The following figures show how large is the reduction of the number of stokers in the case of an oil-driven ship, and how much lower is the cost of re-fueling:

	Steam-ship	Oil-driven vessel	Reduction to
Number of stokers	246	60	21.8%
Working hours occupied in re-fueling and paid for	9.600	80	0.83%

Moreover, it should also be recorded that among the millions of tons of shipping laid up in 1921, in all shipping countries apart from Germany, owing to the supply being far greater than the demand, there was not one single motor vessel. This latter type of vessel could alone be run at a profit when steamships had ceased to be remunerative. There can be little doubt that oil-driven shipping will predominate in the future.—*Nautical Gazette,* 3 June, 1922.

DESCRIPTION OF NEW 11,000-TON VESSEL WHICH CONSUMES ONLY TEN TONS OF FUEL OIL PER DAY.—Burmeister and Wain of Copenhagen have just completed the motorship *Teneriffa,* which is the largest Diesel engined vessel yet turned out in these yards. The ship is 425 feet long, 55 feet broad, and 38 feet, 6 inches deep, with a dead-weight capacity of 10,875 tons.

The machinery consists of two main engines of the Burmeister and Wain 6-cylinder 4-cycle short stroke type. This installation will develop a normal average speed at sea of 11¼ knots, the stipulated normal consumption of fuel oil per day being 10 tons. On her recent trial trips the engines developed an average indicated horsepower of 3,383 at 138 revolutions per minute, the average speed being 12.29 knots.

The machinery is placed midship and the loading and unloading take place by means of five large cargo hatches, served by 12 winches. The 5-ton after winch has warping ends arranged on an elongated shaft to serve also as a warping winch.

The main engines are short stroke, forced lubricated, cross head engines on the front end fitted with three stage air compressors supplying the necessary injection air for atomizing the fuel oil.

All auxiliary machinery in the engine room as well as the deck machinery is electrically driven, the necessary current being supplied by three 60 k.w. Diesel dynamos. The voltage of the current is 220 volts and for the lighting purpose it is transformed down to 110 volts by means of a motor generator.

Each of the generators is sufficient for supplying the necessary current under normal working conditions at sea, whereas two or three generators have to be started, when the consumption of current is large, as is the case when the ship is maneuvering with the maneuvering compressor running, or when loading or unloading, the winches using much current.

The heating is effected by means of steam produced in a small cross tube boiler of 100 square feet heating surface, this boiler also being able to deliver steam for fire extinguishing in holds.—*Nautical Gazette,* 21 May, 1922.

HOW THE AUSTRIAN FLEET ATTACKED ITALY: A WELL-PLANNED OPERATION AND ITS CONSEQUENCES.—A further interesting chapter of the Austro-Hungarian navy's war history appears in the May number of the *Marine Rundschau,* jointly contributed by two officers of the old "K und K Marine," MM. Mazetti and Igálssy von Igály. They give the first detailed account of the naval attack against the Italian coast on May 24, 1915, immediately following Italy's declaration of war. According to the authors, it was known on May 20 that war was inevitable, and the Austrian fleet was at once made ready for action, but the order to raise steam was not issued

till the twenty-second. "The tension was acute, and officers and crews joyfully anticipated the signal. Finally, at 2:30 P. M. on the twenty-third, came the flagship's order, 'Raise steam in two boilers,' which at 5 P. M. was altered to 'All ships raise steam in all boilers.' The crews were then mustered aft to hear the reading of the declaration of war. Like a storm of hate, passion, joy, and lust of battle broke forth the resounding cheers. Men embraced one another, threw their caps in the air, and looked gleefully at their officers. Thus we began." The final preparations for sailing were hastily completed. All details of the projected attack on Italy had been worked out days beforehand, and at 6:30 P. M. the first group, led by the *Saida,* weighed and left harbor amidst scenes of great enthusiasm. They were followed by the destroyers and torpedo-boats, and then came the *Hapsburg*—to which old battleship Admiral Haus had temporarily transferred his flag—and the rest of the battle fleet.

A course was shaped for Ancona, 20 torpedo-boats sweeping ahead for mines. As none were found, the boats took up their screening positions when the fleet was five miles out, and four were detailed to accompany the battleships *Zrinyi* and *Radetzky,* which had a special mission to perform. At 12:30 A. M. in bright moonlight, an Italian airship was sighted and driven off by the flagship's A. A. guns. Two Italian torpedo-boats were also seen and fired at. Between 1:30 and 2:30 the *Radetzky* and *Zrinyi,* with their screening torpedo-boats, left the main body and proceeded to their assigned positions. The scouting group, consisting of *Saida, Szigetvar, Balaton,* and *Triglav,* had previously left to form a patrol line between Pedaso and Porto Tajer, while the *Csikos* and *Velebit* had been sent on ahead to reconnoitre the breakwater at Ancona, and, if possible, to sink shipping in the harbor. "Gradually the outline of the Italian hills became visible. At 2:30 the two squadrons separated, the second proceeding towards Ancona at higher speed, and the first continuing astern at low speed. At 4 A. M. the ships of the second squadron opened with all heavy and medium guns on military objectives ashore, the fire being returned slowly and feebly by the land batteries. Our ships steamed past Ancona at a range of only 4,155 yards. Shortly after the bombardment began two of our aeroplanes appeared over Ancona and used their machine-guns against Fort Alfredo Savio, driving the gunners from their pieces. Thirty bombs were also dropped." Austrian torpedo-boats boldly entered the harbor and torpedoed a steamer. The first squadron had been ordered to open fire at 13,120 yards, but, in obedience to a signal from the flagship, it closed the range to 6,500. The *Tegetthoff* opened at 4:30 A. M., and soon after all ships were firing heavy salvos, the *Erzherzog Franz Ferdinand* being the last to join in.

Columns of smoke and flame marked where the shells exploded, and a dense cloud of smoke and dust hung over the town. The fort and a steamer that lay on the stocks nearby were totally destroyed. The bombardment continued for nine minutes, after which, as all targets had been heavily damaged, the fleet drew off, and at 5 A. M. retraced its course. "There was a slight but undeniable nervousness of submarine attack, but the Italian report that the appearance of the submarine *Foca* had interrupted the bombardment and forced the fleet to retreat was not true." On the other hand, it is admitted that "a certain lack of squadron discipline" manifested itself during the return cruise, but this is attributed to the fact that no major evolutions had taken place for the previous nine months. Surprise is expressed that the Italian submarines at Venice made no attempt to intercept the fleet off Pola, which they might have attacked with success while it was altering formation to enter the swept channel.

Meanwhile, the other units of the fleet had performed the various tasks allotted to them. The "*Novara* group," comprising *Novara, Scharfschütze,* and *T. B.'s-78, 79, 80,* and *81,* led by Captain Horthy, had orders to attack

Porto Corsini and the enemy destroyers and submarines which were believed to be lying there. The destroyer *Scharfschütze* did, in fact, penetrate well into the narrow channel leading to the port, and opened fire on the infantry barracks, apparently causing many casualties. But the Italian batteries were on the alert, and a hot fire was directed against the *Novara* and *T.B.-80*, the latter being severely hit, while the *Novara* herself was repeatedly struck and had fairly heavy casualties. The *Scharfschütze*, however, escaped from the channel without damage. The armored cruiser *Sankt Georg*, with *T.B.'s-1* and *2*, had been ordered to attack Rimini and shell the railway bridge, station, barracks, sulphur works, and water reservoir at a range of about 4,400 yards, but in this case the bombardment was not very effective, and little damage appears to have been done. The battleship *Zrinyi*, with two torpedo-boats, had the task of shelling the important railway bridge over the Misa river at Senigaglia, which was done at range of 3,300 yards, the bridge, together with a troop train, being destroyed. The *Radetzky* bombarded the ferro-concrete railway bridge, 410 feet in length that spans the river Potenza, but, although a heavy fire was opened at only 2,200 yards, the damage inflicted was not serious.

While all these operations were in progress, the *Saida*, *Szigetvar*, *Balaton*, and *Triglav* patrolled the line between Pedaso and Porto Tajer, thus guarding the fleet against a surprise attack by enemy forces coming from the southward. The screen was further completed by cruisers and destroyers from Sebenico (*Helgoland*, *Admiral Spaun*, *Czepel*, *Lika*, *Orjen*, *Tatra*, *Wildfang*, *Streiter*, *Ulan*, *Uskoke*), which throughout the night patrolled between the Dalmatian and Italian coasts. At dawn on May 24 certain of these vessels attacked the Italian seaboard at Barletta, Manfredonia, and Termoli. Soon after the *Helgoland* had opened fire on Barletta, the Italian destroyers *Aquilone* and *Turbine* were sighted coming out. The former, zigzagging at high speed, escaped in the direction of Bari, but the *Turbine* was headed off by four Austrian destroyers and finally brought to a standstill with a shell in her boilers, but not before she had damaged the *Czepel*. She was abandoned after the crew had been removed, and eventually foundered. While engaged in this rescue work the Austrians sighted two enemy vessels approaching, which were at first taken for battleships, but soon identified as the *Liba* and an auxiliary cruiser, their obvious purpose being to cut the *Helgoland* and her destroyers off from Sebenico. A running fight now ensued at high speed, the range varying from 8,750 to 9,800 yards, during which, it is claimed, the *Liba* received two hits. The Italian fire was "very good," the first salvo falling close alongside and the second straddling both *Helgoland* and *Czepel*, though neither was hit.

In summing up these initial operations against Italy the authors claim that complete success had been achieved. "While the enemy suffered heavy losses in men and material, we lost not a single vessel, and our casualties were light. The purpose of the attack, that of crippling enemy traffic on the east coast, and thus delaying the advance of the Italian army, had been completely fulfilled. The moral results were also considerable. Austria-Hungary's preparedness for war at sea had a very depressing effect on the inhabitants of the Italian east coast, and this effect lasted all through the war, paralysing the coastal shipping. Troops refused to proceed north by the coast railway; large concentration camps with strong garrisons were established along the seaboard; and the Italian war industry was called upon to provide a great deal of material for the defence of this vulnerable frontier. It is an established fact," the authors declare, "that the consequences of this naval operation strongly influenced the opening stages of the campaign on the Isonzo front; indeed, it may be affirmed that but for this operation Italian troops could have pressed far beyond the Isonzo almost without fighting, by sheer

weight of numbers, and perhaps even have reached our originally planned line of defence at Adelsberg. In any case, Italy was never so near to capturing, without appreciable loss, Trieste, and thus cutting off Istria and our fleet from the hinterland." It would be instructive to hear the Italian opinion on these claims.—*Naval and Military Record,* 24 May, 1922.

The Immunity of Public Ships.—The immunity of public ships is to be one of the chief items on the agenda of the conference to be held in London, on October, of the Comité Maritime International. It is understood that this has been arranged at the instance of the chamber of shipping of the United Kingdom, but the matter seems to have originated with a formal note addressed by Mr. Justice Hill to the Comité Maritime International in which he invited them to consider the question of the immunities of sovereign states in respect of proceedings against maritime property (ships and cargoes) owned or used by them. In his note, Mr. Justice Hill points out that a British sovereign cannot, against his will, be made subject to the jurisdiction of his own courts, nor can his property be proceeded against; and this immunity, in compliance with international comity, is extended by the British courts to foreign sovereign states.

The result is that where ships belonging to sovereign states are involved in collision, or where such ships and state-owned cargoes have salvage services rendered to them, they cannot be arrested or be made the subject of legal proceedings in the ordinary way unless the sovereign state consents. Even as regards ships privately owned, but in the possession or service of a sovereign state, the courts will not allow them to be arrested, because in this way the sovereign state would be deprived of their use. Several examples are given in the note. The *Broadmayne* was a British ship in the service of the British sovereign during the war. The action was for salvage, but all proceedings with a view to the arrest or detention of the ship were stayed so long as the ship should remain under requisition in the service of the crown. The *Messicano* was an Italian ship in the service of the Italian Government. It was involved in a collision, and a similar order was made.

The cases instanced by Mr. Justice Hill arose during the war, and the service in which the privately owned ships were engaged was in the nature of war service; but, as he points out, there seems to be nothing in principle to prevent privately owned ships in the service of a sovereign state being immune from arrest in respect of matters arising out of ordinary trade service, although this cannot be treated as settled law. The grave objections to the immunity of such ships from legal proceedings and arrest, at least when they are engaged in times of peace and in trade, are referred to in the note. In one case it was said: "It is a great hardship upon the persons who have claims against such privately owned vessels that they should lose their most substantial remedy (arrest) ; and, in the interest of safe navigation, it is most unfortunate that there should be a number of vessels navigating the seas whose owners know that however negligently they may be navigated. no maritime lien can be enforced on the vessel while it is in state employment."

Mr. Justice Hill concludes by expressing the opinion that a remedy for the unsatisfactory position at present existing is to be sought on such lines as these: if sovereign states engage in trade and own trading ships of their own or use trading ships of private persons, they should submit to the ordinary jurisdiction of their own and foreign courts, and should permit those courts to exercise that jurisdiction by the ordinary methods of writ and arrest; and it is a matter for consideration whether this should not apply also to state-owned ships not engaged in trade, at least, to the extent of providing some means whereby an undertaking to pay should take the place of arrest and bail. It is satisfactory that these

important questions are to be considered by the Comité Maritime International, especially as a committee was recently appointed by the lord chancellor to consider the whole question of civil proceedings by, and against, the British Crown. At present, as has been repeatedly pointed out, in all legal proceedings against the Crown, the dice are seriously loaded against the subject.—*Engineer,* 12 May, 1922.

THE SPANISH NAVY.—Alone among maritime powers of the second rank, Spain is devoting marked attention to the development of her navy. The programme of new construction now in hand makes quite an impressive showing, though it does not include any vessel above the grade of light cruiser. The *Reina Victoria Eugenia,* of this type, which was laid down at Ferrol dockyard in March, 1915, and launched two years ago, began her trials at the end of last November, when she is said to have easily exceeded her contract speed of 25.5 knots. The inordinate length of time occupied in building this ship was due entirely to the war, it being impossible to obtain delivery of certain materials and fittings until after the armistice. However much Spanish dockyards may have deserved their former notoriety for leisurely construction—some cruisers took twelve years to complete—they have since become remarkably efficient, and, given the necessary material, can now turn out war vessels as expeditiously as any other yards on the continent. The design of the *Reina Victoria Eugenia,* which closely resembles that of our light cruisers of the *Birmingham* class, was prepared as long ago as 1914, and is therefore obsolescent according to the post-war standard. The ship is 462 feet long over all, 49¾ feet in breadth, and draws 16¾ feet at full load. Her displacement is 5,600 metric tons. She is fitted with Parsons straight-drive turbines and 12 Yarrow boilers (coal and oil), the machinery developing 22,500 s.h.p. The main armament of nine 6-inch, 50-cal. guns, manufactured by Vickers, is arranged exactly as in H. M. S. *Birmingham,* but the two 21-inch torpedo tubes are above water instead of submerged. A 3-inch belt of nickel steel, carried up to the upper deck amidships and tapering to 1½ inches at the extremities, is reinforced by a protective deck with a maximum thickness of 3 inches.

Two cruisers of much improved type have been authorized, one of which is reported to have been begun at Ferrol. Particulars as given in the Spanish papers are as follows: Length, 537½ feet; beam, 52½ feet; displacement, 7,850 tons; machinery, geared turbines and oil-fired boilers, developing 80,000 s.h.p. for a speed of 36 knots. It is probable, however, that the designed speed does not exceed 33 knots. The armament consists of eight 6-inch, 50-cal. guns, all disposed on the centerline, six of them being twin-mounted; four 3-inch or 4-inch anti-aircraft guns, and twelve above-water torpedo tubes on triple carriages. These two ships are unofficially reported to be named *Augusta Victoria* and *Almirante Cervera.*

Other vessels authorized or building for the Spanish navy are: (a) Three flotilla leaders, displacement variously given as 1,350 and 1,600 tons, 34 knots, four 4-inch guns and four tubes; (b) several torpedo boats, of 180 tons and 28 knots; (c) six submarines, 710 tons submerged displacement, surface speed 16 knots, endurance 4,200 sea miles, armed with one 3-inch gun and four tubes; and (d) three gunboats, 1,350 tons, 15 to 18 knots, mounting four 4-inch guns. All the above work is divided between the Ferrol and Cartagena yards. In addition an aircraft-carrier and several auxiliaries are in hand.—*Naval and Military Record.*

SPEED LIMIT IN GREAT CANALS.—The following table shows the length of five of the world's leading canals and the maximum speed at which vessels are allowed to traverse these waterways:

Canal	Length in Miles	Miles per Hour
Amsterdam	15.5	5.6
Kiel	61	6.2
Manchester	35	6
Panama	40.5	8
Suez	104	6.1

—*Nautical Gazette,* 5 June, 1922.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"French Naval Ideas"—*Quarterly Review,* April, 1922.

"Details of French Coastal Motor Boats"—*Engineering,* 15 May, 1922.

"The German Submarine Building Program, 1914-1918"—*The Engineer,* 21 April, 1922.

"The Northern Blockade"—*Journal of the Royal Artillery,* May, 1922.

"The Naval War, 1914-1915"—*Quarterly Review,* April, 1922.

"Some Proposals Made for the Protection of Merchant Ships Against Submarines"—*The Shipbuilder,* Annual Number, 1922.

"The New Crane Ship for the Navy"—*Technical Engineering News,* June, 1922.

"The Problem of Moving Airships"—*Scientific American,* June, 1922.

"Nozzle Losses in Compound Turbines"—*Engineering,* 19 May, 1922.

"A Meter for Reading Alkalinity of Boiler Feed Water"—*Power,* 16 May, 1922.

"The North Atlantic Ice Patrol"—*Scientific American,* June, 1922.

"Uncle Sam and Radio"—*Scientific American,* June, 1922.

"Photography of Bullets in Flight"—*Journal of the Franklin Institute,* May, 1922.

NOTES ON INTERNATIONAL AFFAIRS

FROM MAY 5 TO JUNE 5

PREPARED BY

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OUTCOME OF GENOA CONFERENCE

RUSSIAN PROBLEM UNSOLVED.—The break-down of the Genoa Conference for a general economic settlement in Europe was made certain when on May 11 the Russian delegates presented a long argumentative reply unfavorable to the terms offered by the other powers. In the hope of a foreign loan, Russia had been willing to accept most of the conditions laid down by the Allies, including recognition of war and pre-war debts, and had hesitated only over the restoration of property. Failing definite promises of a loan, Russia's attitude changed. The Russian reply declared that the purpose of the powers in haggling over private property was in reality to destroy the communistic system, that political questions, such as Russia's relations with Turkey and Rumania, had been needlessly injected into the discussion; and finally that governments arising out of revolution could rightfully repudiate the obligations of governments overthrown.

PLAN FOR DISCUSSION AT THE HAGUE.—Following the failure of Russian negotiations at Genoa, Premier Lloyd George proposed that these negotiations be resumed at The Hague. According to this plan the nations represented at Genoa, except Germany and Russia, were to send representatives from which a commission of experts would be selected to formulate a Russian policy. The experts would meet on June 16, and on June 20 present their conclusions, which would then be taken as a basis for negotiations with the Russian delegates. Upon the acceptance of this proposal by Russia the Genoa Conference ended on May 17.

The agreement contains six clauses, summarized as follows:

Clause I.—Provides for the appointment of a commission by the powers to examine again the divergencies existing between the Soviet Government and other Governments, and with a view to meeting a Russian commission having the same mandate.

Clause II.—Not later than June 20 the names of the powers represented on the non-Russian commission and the names of the members of this commission will be transmitted to the Soviet Government, and, reciprocally, the names of the members of the Russian commission will be communicated to the other Governments.

Clause III.—The questions to be treated by these commissions will comprise debts, private properties and credits.

Clause IV.—The members of the two commissions must be at The Hague on June 26.

Clause V.—The two commissions will strive to reach joint resolutions on the questions mentioned in Clause III.

Clause VI.—To permit the commissions to work peacefully, and also to re-establish mutual confidence, the Soviet Government and its allied republics on the one side and the other governments on the other, pledge themselves to abstain from any act of aggression and subversive propaganda. The pledge for abstaining from any act of aggression will be based upon the present *status quo*, and will remain in force for a period of four months after the conclusion of the work of the commission.

The pledge concerning propaganda will oblige the Governments not to interfere in any way in the internal affairs of other states, and not to assist, financially or by any other means, political organizations in other countries, and will oblige them to suppress in their territory "any attempt to commit acts of violence in other states or aiming to disturb the territorial or political *status quo*."

The final adoption of the truce compact was without incident except that Lithuania inquired whether the truce would prevent powers other than Russian from attacking each other. In other words Lithuania was anxious to know whether Poland would be prevented from attacking Lithuania in connection with the dispute over Vilna or the other boundary questions between the two nations. Assurance was given the Lithuanians that the peace would be general.

UNITED STATES REFUSES TO JOIN CONFERENCE.—When the conference at The Hague was proposed, it was hoped that the United States would send a delegation, and an invitation was at once extended. On May 15, however, Secretary Hughes declined the invitation in a reply the main part of which reads as follows:

The American people have given the most tangible evidence of their unselfish interest in the economic recuperation of Russia, and this Government would be most reluctant to abstain from any opportunity of helpfulness.

This Government, however, is unable to conclude that it can helpfully participate in the meeting at The Hague, as this would appear to be a continuance under a different nomenclature of the Genoa Conference and destined to encounter the same difficulties if the attitude disclosed in the Russian memorandum of May 11 remains unchanged.

The inescapable and ultimate question would appear to be the restoration of productivity in Russia, the essential conditions of which are still to be secured and must in the nature of things be provided within Russia herself.

While this Government has believed that these conditions are reasonably clear, it has always been ready to join with the Governments extending the present invitation in arranging for an inquiry by experts into the economic situation in Russia and the necessary remedies. Such an inquiry would approximately deal with the economic prerequisites of that restoration of production in Russia, without which there would appear to be lacking any sound basis for credits.

It should be added that this Government is most willing to give serious attention to any proposals issuing from the Genoa Conference or any later conference, but it regards the present suggestions in apparent response to the Russian memorandum of May 11, as lacking, in view of the

terms of that memorandum, in the definiteness which would make possible the concurrence of this Government in the proposed plan.

ATTITUDE OF FRANCE.—At the Genoa Conference the solidarity of France and Great Britain was seriously threatened by their divergent views on Russia. France, followed by Belgium, Poland, and the Little Entente, held that what the Soviets had taken from foreigners they must return, while the English were willing to accept posesssion, with technical ownership vested in the Soviet Government. When the Hague Conference was proposed, the French and Belgian delegates felt it necessary to leave the decision to their respective governments. On June 3, Premier Poincaré published a memorandum stating the French position. The memorandum declared that first of all Russia should be forced to withdraw her note of May 11, and then should accept flatly recognition of her war debt, pre-war debt, and return of naturalized property formerly owned by foreigners. Russia must drop her counter-claims, and realize that she can get no government loan now. Then and then only should the experts take up the problem of help for Russia.

Speaking before the Chamber of Deputies on June 1, M. Poincaré declared that while he did not seek to break the Entente, France must be treated as an equal and not "dragged along at England's tail." As regards the Hague Conference, France, he said, had reserved entire freedom of action. Without the United States the inquiry would be necessarily incomplete, and the reconstruction of Europe without the great creditor republic would be chimerical.

ITALY AND THE NEAR EAST

RUSSO-ITALIAN TRADE AGREEMENT.—In accepting the proposal for a conference at The Hague, Italy as well as Japan and other states reserved the right to conclude trade agreements with Russia which were already under negotiation. Accordingly, on May 24, Italy and Russia signed a commercial treaty completing the provisional accord of last December. Russia was ready to grant even more extensive concessions with the idea of showing what the other powers had lost by their attitude at Genoa. Italy, however, was unwilling to enter into any agreement which would sacrifice her moral obligations to her allies.

JUGO-SLAV AGREEMENT WITH ITALY.—*Rome, May 8.*—While the delegates of Italy and Jugo-Slavia are striving to reach a political agreement, an important commercial and financial pact has been signed at Genoa, as a result of long negotiations, according to the newspaper *Italie.* The agreement creates a union between Jugo-Slav and Italian banks and is expected to facilitate a further interchange of goods, an interchange which already exceeds 1,000,000,000 lire yearly.

The agreement was signed by Italian deputies on behalf of a group of banks in Lombardy and Venetia, and besides safeguarding Italian imports within Jugo-Slavia, it is intended to aid in the demoblization of Italian credits, amounting to several hundred million lire, subject to a moratorium in Jugo-Slavia. Adriatic ports, especially Trieste, benefit greatly from the new pact, which marks a new era in Italo-Slav relations.

An agreement on the question of Fiume's difficulties is almost impossible and Jugo-Slavia is, therefore, insisting that the whole question be remitted to the arbitration of the president of Switzerland.—*Christian Science Monitor,* 9 May, 1922.

Investigation of Turkish Artocities.—On May 15 Mr. Austin Chamberlain announced in the British House of Commons that Great Britain had proposed to France, Italy, and the United States a joint investigation of charges of Turkish cruelty to Greeks in Asia Minor. The charges were based chiefly on the reports of Major F. B. Yowell and Dr. M. L. Ward, American officials of Near Eastern Relief at Harpoot. According to their reports the Turkish system of deporting Greeks eastward through Harpoot was resulting in countless deaths from hardship, exposure, and cruelty.

In an interview at Constantinople on June 1, Izzet Pasha, the Turkish foreign minister, admitted that the Greek population in Asia Minor had suffered, but made counter-charges against the Greeks. He claimed that Greece would eventually be unable to support the cost of her army in Asia Minor. Admiral Bristol, American high commissioner, was quoted as saying that peace could be established in Asia Minor in only two ways—either by the western powers' maintaining a large force there, or by leaving the Turks to handle the situation with substantial guarantees for the protection of minorities.

America to Join Inquiry.—On June 3 Secretary Hughes in the following statement announced the decision of the American government to take part in the Turkish investigation:

"On May 15, 1922, a note was received from the British Ambassador referring to reports of the renewal of the deportation of Christians by the Turkish authorities at Angora and the alleged atrocities connected therewith, and communicating a proposal of the British Government that the American, British, French and Italian Governments should at once depute carefully selected officers to proceed to such places in Anatolia as might best enable them to conduct an appropriate investigation.

"In a subsequent memorandum of May 19 the British ambassador indicated that the Turkish deportations and outrages might lead to retaliatory action in territory held by the Greek forces, and suggested that the Government of the United States should join in requesting the authorities functioning in Greece to permit the dispatch of officers to regions under Greek occupation.

"In answering these communications, the secretary of state has said that the situation of the Christian minorities in Turkey has enlisted to a marked degree the sympathies of the American people and it has been noted with deep concern, that the work of benevolent and educational institutions in Turkey has steadily been hampered, that the rights which American citizens have long enjoyed in Turkey in common with the nationals of other powers have often been disregarded and the property rights and interests of Americans and other foreigners placed in jeopardy.

"In view of the humanitarian considerations which are involved and of the desire of this Government to have adequate information through a thorough and impartial investigation of the actual conditions prevailing in Anatolia in order that this Government may determine its future policy

in relation to the authorities concerned, the President is prepared to designate an officer or officers to take part in the proposed inquiry.

"In informing the British Government of the foregoing the Government of the United States has made it clear that the proposed action is limited in scope to an inquiry to obtain accurate data as to the situation in Anatolia for the information of the Governments participating therein, and has stated that this Government assumes no further obligation and enters into no commitment.

"In order to expedite the inquiry, it was at the same time suggested by this Government that officers should be designated by the respective Governments to institute inquiries concurrently in the districts respectively under Greek and Turkish occupation, and that these two commissions, upon the completion of their investigation, should unite in a comprehensive report."

MANDATES AND NAVAL TREATIES

RATIFICATION OF NAVAL TREATIES.—It was reported from London on May 29 that while the Washington naval treaties had not yet been ratified, measures to put them into force had already been taken, such as reduction of personnel and dismantling of battleships which are to be discarded. While the treaties might be brought before Parliament for a formal vote, this was not necessary since the signature of the King was sufficient for legal ratification.

The naval treaties were reported to the French Parliament on May 30 with a reservation attached similar to that adopted by the U. S. Senate. It was stated that consideration of the treaties would occupy at least a month, and that to the agreement prohibiting submarines from attacking merchant vessels a reservation might be made declaring that a merchant vessel to be so classified must be unarmed.

AMERICA ACCEPTS PALESTINE MANDATE.—*Washington, May 9.*—A vertual agreement has been reached between the United States and Great Britain with respect to the mandated territory of Palestine. The details of the agreement to be worked out will soon be incorporated into a treaty between the two Governments.

It is expected in general that the treaty will guarantee the rights of Americans to participate on an equal footing with the nationals of Great Britain or any other country in the exploitation of the natural resources of Palestine and in its commerce and industry. This is the fundamental doctrine of this Government with respect to mandated territories, it having been enunciated both by the Wilson and Harding administrations.

The tangible rights of Americans in Palestine consist chiefly of the so-called "capitulary rights," or rights of extra territoriality conferred upon the citizens of this country by the Treaty of 1830 with Turkey, and of certain rights acquired by the Standard Oil Company in Palestine prior to the World War.—*New York Times,* 10 May, 1922.

FRENCH MANDATES APPROVED.—On May 17 the United States Government announced its approval of the terms of the French mandates over Kamerun and Togoland in Africa, as well as the French mandate over Syria. Treaties with France will be negotiated similar to those with Japan over Yap and with Great Britain over Palestine. The mandate terms are

to be taken up at a special meeting of the League of Nations Council not later than July 15.

WORK OF LEAGUE COUNCIL.—The work of the League of Nations Council meeting at Geneva, which closed on May 17, was summarized as follows:

The work of the session, is declared to have been the most important since the founding of the council. Among other achievements noted are, first, the signature of the German-Polish economic treaty and the settlement of the Upper Silesian question; second, the throwing open of the Court of International Justice to the entire world, including Russia, Turkey and Mexico; third, the establishment of a financial and economic protectorate over Albania by the League of Nations; fourth, the setting of a definite date for the final disposition of the Palestine mandate, and fifth, the creation of a commission for international intellectual co-operation, with an American member.

The council also considered more than a dozen minor European questions and approved the Opium Commission's work.

It was decided by the council to hold its next meeting a week before the gathering of the General Assembly of the League of Nations, or about August 28. This date, however, is not intended to interfere with the extraordinary meeting of the council to be held probably on July 15, which will be devoted to mandates.

RATIFICATION OF SILESIAN TREATY.—It was reported from Genoa on May 9 that Foreign Minister Rathenau of Germany and Foreign Minister Skirmundt of Poland had accepted and signed the League of Nations Settlement of the Silesian problem. On May 30 the German Reichstag ratified the treaty, the flag on the Reichstag building appearing at half mast and the Chancellor and Cabinet in mourning.

It will be recalled that the Upper Silesian question was referred by the Supreme Council to the Council of the League of Nations after England and France were unable to agree on how the frontier between Germany and Poland should be drawn as a result of the unsatisfactory plebiscite. The council of the league drew a line and now it is accepted and instructions have been sent to the German and Polish representatives in Geneva to sign the treaty.

The document in addition to accepting the frontier is a large volume regulating the intricacies of the industrial region with in many instances raw materials and fuels in one country and factories in another, the workmen sometimes living in Poland and doing their day's work in Germany.

The treaty, modeled on the recommendation of the league agents, is to remain in force fifteen years.—*New York Times,* 10 May, 1922.

GERMAN REPARATIONS

ALLIED DEMANDS ACCEPTED.—The threatened reparations crisis of May 31 was avoided when on May 29 the German Government sent in an acceptable reply to the demands of the reparations commission. Germany submitted to Allied control of her finances to the extent of agreeing to turn in full and accurate budget figures to the reparations commission. Issues of paper money were to be stopped at least temporarily. Further laws were to be passed to prevent export of German capital from the

country and so far as possible to force its return. On May 24 the Reichsrat adopted the compulsory loan bill (which had already passed Reichstag) providing for the raising of about one billion gold marks. According to the German note, the success of all Germany's efforts to meet her obligations would be contingent upon the granting of an international loan.

The reparations commission unanimously accepted this reply on the part of Germany as "a sincere attempt to meet the commission's requirements," and on that basis agreed to a postponement of further German payments for the year 1922.

Bankers Consider German Loan.—An international commission of bankers, including representatives of the Allied Powers, Holland, and the United States, met under the auspices of the reparations commission at Paris on May 24 to consider the possibilities of an international loan to Germany. One of the first acts of the committee was to state that no loan could be considered until Germany met the demands of the reparations commission, and this did much to hasten the favorable German reply of May 29.

On June 1 the British representative, Sir Robert Kindersley of the Bank of England, argued that a reduction of Germany's total reparations debt was an essential condition to her negotiating an internationl loan, on the ground that investors would not be attracted to such a loan, unless Germany were put in a position to "see daylight" financially.

This proposal at once revealed the political difficulties attending the loan problem, since France in particular would be reluctant to consent to a reduction of the reparations debt without a corresponding reduction of her own debt to the United States and Great Britain.

France regards all international indebtedness, including reparations, as one entity. Rightly or wrongly, she regards what Germany owes her for war damage—the figure was fixed by the International Commission of Five on which she had one vote—as just as much a debt as her debt is to the United States. She is willing to reduce Germany's debt to her if her creditors reduce their claims on her. In other words, France is willing to cut down the reparations total if Great Britain and the United States reduce her debt to them.

France probably is willing to do more than make a corresponding reduction. She may be willing to follow England's example and make a sacrifice in addition to the amounts cut off her debt. But with France burdened as she is by taxation to pay for the reconstruction of what Germany destroyed it is perfectly useless to talk to her about cutting down Germany's debt to her by tens of billions of dollars for the prospect of sharing in a billion dollar loan. French public opinion would not stand for that.

Therefore if such proposed international loan is to depend on reducing the reparation figure, and it is safe to say a majority of the bankers including those representing the countries from which the money would have to come considers that necessary, then America must say yes or no to Europe's question put by Britain as to whether she will sacrifice some of her claims for the general world good. It must be recognized that as seen

from this side of the Atlantic the prospects do not seem good until American public opinion sees the affair in a different light.

If it be true, as most authorities agree, that international debts are a monkey wrench in the machinery of international business, it is worth while to look at those debts. Europe owes America roughly $10,750,000,000, approximately as follows: England $4,573,000,000, France, $3,635,000,000; Italy, $1,800,000,000; Belgium, $410,000,000; Rumania, $38,000,000; Serbia, $55,000,000; Greece, $15,000,000, and Russia, $212,000,000.—*New York Times,* 16 May, 1922.

GREAT BRITAIN AND IRELAND

COALITION OF IRISH FACTIONS.—On May 20, after prolonged negotiations, an agreement was reached between the Collins and de Valera parties in Ireland by which a trial of strength in the coming elections was avoided and a coalition government established. The agreement provided that the control of the Sinn Fein organization (and later of the Irish Free State) be vested in a coalition cabinet, the army naming the minister of defense, and the other nine members to be taken, five from the majority and four from the minority party.

It provided further that nominations for the parliamentary elections be made on June 6, and elections held on June 16, and that the candidates be put forward as from the Sinn Fein organization and be taken from the two factions in such proportion as to give each faction the same strength as before. The purpose was thus to present an actual expression of popular opinion, although other interests and organizations were left free to nominate candidates and contest the election if they so desired.

CONFERENCE IN LONDON.—In order to explain the conditions arising from the new coalition in Ireland, and also to give information regarding the new Free State Constitution, Mr. Collins, Mr. Griffiths, and other Irish leaders came to London on May 26 for conferences with the British cabinet committee in Irish affairs headed by Winston Churchill. Apparently when the conferences closed early in June the British cabinet members were satisfied with the assurances given against violation of the Anglo-Irish Treaty.

Speaking in the House of Commons on May 31, Winston Churchill declared that the Collins-de Valera compact struck at the treaty, and that if de Valera refused to declare his loyalty to the treaty, Great Britain would feel at liberty if necessary to reoccupy Ireland. No deviation from the treaty, he declared, would be allowed either in strict letter or honest spirit.

In the meantime fighting and outrages continued in Belfast and along the Ulster border. On May 23 the Ulster Government issued a proclamation calling for the arrest of all members of the Irish Republican Army and similar organizations. On May 30 it was reported that Irish Republican forces had entered and established themselves within the six-county frontiers. Premier Craig of Ulster declared he would have no negotiations with the new coalition in the south. British reinforcements were being sent

to Ulster, and on June 5 attacked the southern Irish forces on the Ulster frontier.

BRITISH WAR FIGURES.—Speaking on May 26 at a luncheon, upon his return from Genoa, Premier Lloyd George gave some new and interesting figures as to the extent of Great Britain's participation in the war. He stated that Great Britain had mobilized, on land and sea, a total of 9,500,000 men; that between 5,000,000 and 6,000,000 of these went to France; that the British dominions sent 1,600,000 men and India 1,679,000; and that the total casualties amounted to 3,266,000.

FAR EAST

CHINESE GOVERNMENT REORGANIZED.—Following his victory over the Manchurian General Chang Tso-lin, General Wu Pei-fu announced his program for the unification of China and the establishment of a strong democratic government. As a first step in this program he declared his intention to force the resignation of both President Hsu Shih-chang at Peking and Sun Yat Sen at Canton. The Peking president vacated on June 2 and was to be succeeded by General Li Yuan-hung, who was president from June, 1916, to July, 1917, when he was overthrown by the militarists. The old republican Parliament met at Tientsin for the first time since 1917.

Washington, June 1.—It is believed by the officials here that recent developments have finally broken the apparently hopeless deadlock into which China had fallen as a result of the clashing ambitions of rival factions in the north and south. Not in the last ten years have the prospects been so bright for a reunion of the country as at this moment, it is said.

This belief is based upon confidence in the integrity of the victorious General Wu-Pei-fu, and his adherence to his plan for bringing the divided sections of the country together by insisting upon the retirement not only of President Hsu at the head of the Peking Government, but of Dr. Sun Yat Sen, who claims to be president as a heritage of the old parliamentary government and holds forth in that capacity in Canton.

General Wu also has promised to efface himself and surrender the command of his armies to any president who is legally chosen by the reconvened Parliament or a constituant assembly.

It is said that if the next step on the program of the reformers can be taken soon, and the numerous provisional armies can be discharged, leaving the sole military power in the hands of the central Government, any evil of militarism afflicting China will be overcome.—*New York Times*, 16 March, 1922.

JAPANESE LEAVE HANKOW.—On May 30 the Japanese minister at Peking notified the Chinese Government of the decision of Japan to withdraw her garrison at Hankow. Since 1911 Japan has maintained a garrison at this point to secure her interests in the Yangtse Valley. The withdrawal is in conformity with the resolution adopted in Washington to remove foreign troops from China as soon as the Chinese Government can afford protection. Ratifications of the Shantung Treaty were exchanged at Peking on June 2 and the treaty is now in full force.

REVIEW OF BOOKS

KIEL AND JUTLAND, by Commander Georg von Hase (Gunnery Officer of the *Derfflinger*). Illustrated, 233 pages. Published by E. P. Dutton and Company, 681 Fifth Avenue, New York. Price $6.00.

Commander von Hase has presented seafaring men in general and naval men in particular with the most intensely interesting narrative of the battle of Jutland yet written. The chronological gunnery records kept aboard the *Derfflinger* during the battle form the basis of the déscription. The book is divided into two parts.

The first sets forth the visit of the British second battle squadron to Kiel during the last week in June, 1914. The author was then assigned to duty with the British commander, Vice-Admiral Sir George Warrender, and his observations are portrayed with a keen touch of human interest. A side-light of the visit is set forth in the following excerpt:

> I realized the very day after the English ships arrived at Kiel that the English were extremely anxious to know all about the modern ships and craft of our fleet. Admiral Warrender sent me that day to our commander-in-chief, Admiral von Ingenohl, and I was commissioned to tell him that Admiral Warrender placed the English ships at the disposal of German naval officers who desired to see them. The admiral particularly insisted that the German officers would be shown *everything* which they cared to see for professional purposes.
>
> Admiral von Ingenohl was absolutely averse to this proposal and instructed me to present his compliments to Admiral Warrender and say that he regretted that he could make no use of this kind invitation, as he could not return the compliment, because, in accordance with regulations, we were not allowed to show many parts of our ships to anyone.

The second part describes the battle of Skagerrak, as the Germans call the battle of Jutland. This recitation of his personal experiences during the battle is spell-binding. From his position in the conning tower he could see the enemy shells coming towards him. He says, "With each salvo fired by the enemy I was able to see distinctly four or five shells coming through the air. They looked like elongated black spots. Gradually they grew bigger, and then—crash! they were here. . . . And again, "Suddenly, we seemed to hear the crack of doom. A terrific roar, a tremendous explosion, and then darkness, in which we felt a colossal blow. The whole conning tower seemed to be hurled into the air as though by the hands of some portentous giant, and then to flutter trembling into its former position. . ."

The book is well illustrated with photographs and charts. The description of the battle is divided into five phases as follows:

First Phase (5.48 to 6.55 P. M.)—*Queen Mary* engaged. Destroyer attacks and their repulse.

Second Phase (6.55 to 7.50 P. M.)—The fifth battle squadron engaged. Beatty's outflanking maneuver.

Third Phase (7.50 to 9.05 P. M.)—Heavy fighting against ships of the line, cruisers, and destroyers. Destruction of the *Invincible. Derfflinger* forced to stop to clear her torpedo-net.

Fourth Phase (9.05 to 9.37 P. M.)—The death ride of the battle cruisers. The German fleet extricated. Destroyer attacks.

Fifth Phase (9.37 to 10.35 P. M.)—Last engagement. Night fighting.

In the final chapter the author in his reflections states why in his opinion, Admiral Jelicoe's strategy was sound.

We find these words in the closing pages of the book. "I close my account of the greatest day we Germans have ever experienced at sea, with the hope that my little book and Churchill's essay may be the means of enlightening many Germans on the enormous influence that sea power has had on the world's history and will continue to have in the future. . ."

I. C. K.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio,* an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become asociate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Asociate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and asociate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

C. C. GILL,

Lieut. Commander, U. S. Navy, Secretary and Treasurer.

TOPICS FOR ARTICLES

Suggested by Request of the Board of Control

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
Shore Duty for Enlisted Men.
The Limits of Specialization in Naval Training.
The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.
Armor or High Speed for Large Surface Vessels?
Airplanes and Submarines Versus Super-Dreadnoughts.
The Navy's Relation to the Nation in World Affairs.

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The U. S. S. "Columbia," Flying the Flag of Admiral H. P. Jones, U. S. N., as She Appeared on February 22, 1922, While at Guantanamo Bay, Cuba, in the Capacity of the Administrative Flagship

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EMPLOYMENT AND TACTICS OF AIRCRAFT IN NAVAL WARFARE

By Commander John P. Jackson, U. S. Navy

The Place of Aircraft in the Military System

1. Throughout the Great War and up to the present time, ideas regarding the strategic and tactical employment of air forces in co-operation with land and naval forces, and as to the co-ordination of the operations of the many different types of aircraft amongst each other, can hardly be said to have crystalized. Aircraft, much as they were used in the Great War, were employed upon more or less detached raids, attacks, scouting and other operations,—sometimes alone, and sometimes in conjunction with land and naval forces,—and the relative proportion of aircraft to land and naval forces, and the proportion of various types of the craft themselves to constitute a well balanced air force, is still to be determined.

2. The exact place which should be occupied by the air force as a whole in the great military scheme in which the land and naval forces have definite and established places, determined through

Author's Note: Since the author is not an aviator many of the statements in this article regarding conditions in the air have been taken from the expert opinions of aviators, to whom acknowledgement is hereby made. The author's purpose is to collect the best available opinion and knowledge in such matters and show their effect upon the tactics of aircraft.

long years of study and practical experience, has not as yet been settled. The very question as to whether the air force should be under a separate administration or be a part of the army and navy, is at this very moment unsettled and under discussion in the principal countries of the world.

3. The question has been a very live one in the United States, and great pressure and much propaganda have been brought to bear from certain sources to take the air forces away from the army and navy and consolidate them into a separate co-ordinate department.* The arguments for and against such a policy are strong and many, and an exhaustive consideration of them would call for a voluminous discussion which would expand this paper far beyond reasonable bounds. I shall content myself therefore with quotations from expressions of opinion of one officer from each of our services. On January 12, 1921, General Pershing, in answer to a letter, expressed himself in part as follows:

> Military forces can never be efficiently trained or operated without an air force.
>
> An air force, acting independently, can of its own account neither win a war at the present time, nor, so far as we can tell, at any time in the future.
>
> An air force by itself can not obtain a decision against forces on the ground.
>
> A military air force is an essential combat branch and should form an integral part of the army.
>
> If success is to be expected, the military air force must be controlled in the same way, understand the same discipline and act in accordance with the army command under precisely the same condition as other combat arms.
>
> An air force, as well as all other branches of the military organization must fully understand its exact functions in working with other branches, must know the needs of other branches, be in full sympathy with them, think in the same military atmosphere, and have the same *esprit de corps* in order that effective battle control may be established.
>
> No such force can realize the above conditions unless it be an integral part of the command not only during battle but also during the entire period of doctrinal training.
>
> To realize these conditions the different arms of the service must live together and train together.
>
> An air force should be established as a separate arm of the service, co-ordinate with the infantry, cavalry and artillery.
>
> The air force should not be established as a combatant force distinct from the army or navy.

*This article was written eight months ago.

4. By substituting the words "naval" for "military," and "navy" for "army" in the above quotation, and where he speaks of "infantry", "cavalry" and "artillery" by substituting the various branches of the naval service, General Pershing's opinion applies with as much force to the navy as to the army.

5. Certain officers of the U. S. Navy are as strongly opposed to having its air force removed from its control and jurisdiction, as is shown from the following quotation of an officer of the aviation section of the navy:

Aircraft considered from a purely naval standpoint will be of use in helping to gain command and to exercise command of the sea, but they never can be the determining factor. The big gun and large surface craft are the controlling factors in gaining command. Such craft (capital ships) combine mobility, protection and armament to the greatest extent. Supported by proper types and a train they can operate for long periods in an enemy area securing permanent local command of this area.

Aircraft possess great mobility but can not occupy an area permanently unless close to a base defended by the guns of ships, or the artillery or infantry of an army. Air control, while specially applicable to breaking up the control of areas either ashore or at sea, is less applicable to keeping permanent control, and, therefore, must base behind the other arms and is best used as an adjunct to the other arms.

Such being the case and military operations necessitating a unified command in which surface craft are maintained in areas supported by variety of arms—destroyers, submarines, aircraft, etc., it is obvious that aircraft at sea must be a part of the operating forces at the disposal of the commander-in-chief and the personnel and the type must be adapted and trained to meet sea conditions.

The seaman considers he has a special training and profession in which long training, drill and experience are required through a life time career. Conversely he has not assumed that he can tell other professions military or civil what their methods, tactics or strategy should be. He does not desire to encroach upon the province of the soldier or civilian as he assumes that each has a special profession. The use of a new arm such as aircraft at sea needs special types and adapting for application to the seaman's problem in securing and exercising control of the sea. Seamen and naval commanders familiar with naval practice, strategy and tactics are necessary in aircraft for naval purposes to fit in properly this arm with the other arms in developing mobile sea power.

I doubt whether in the future any Admiral on the navy list will care or dare to guarantee the national defense at sea if the naval air forces are detailed from another corps in which the personnel are dependent for development technically and professionally and for pay and promotion upon such other corps foreign to the navy, and in which the material is dependent upon the decision of officials outside of the service. This responsibility

for the national defense at sea is carried by officers of the navy and it cannot be shifted.

6. In addition to the military reasons against a separate air force, there are many considerations in the development of civil and commercial aviation which indicate that it is much more advantageous to have separate government organizations in control of the air forces of the nation than to have these consolidated into one. These arguments are even more voluminous than the military ones, and no attempt can be made to present them here.

THE CAPABILITIES OF AIRCRAFT

7. War as conducted on land and sea has, through centuries of practice and experience, laid down certain well known and immutable principles. In other words a doctrine for the conduct of war on land and sea has come to be recognized. The advent of aircraft has introduced elements so different from those hitherto employed, and whose capabilities are as yet so little appreciated, that an entirely new field has suddenly been opened up for the conduct of hostile operations, with possibilities which may well revolutionize modern warfare. As an example of the confusion of thought which at present exists, may be taken the present controversy between the aircraft and the battleship, which is raging throughout the world. Extreme adherents of the aircraft claim that the recent experiments in the United States have unconditionally rendered the most modern battleship obsolete. The advocates of the battleship, on the other hand, claim that its position as the backbone of a naval force is unshaken, and that a new weapon has merely been introduced, which must be guarded against.

8. The truth of course lies as usual between the two extreme views. It is far from proven that the battleship is obsolete, but on the other hand there is no question that a most serious menace to its existence has been brought into being. How far then is a nation justified in depending upon battleships for its defense? And to what extent should it develop its air force, not only as a menace to the land and naval forces of an enemy, but also to co-operate with its land and naval forces in their own defense and the defense of the nation itself?

9. This is a major question of military policy and strategy, and its solution depends upon the development of a sound doctrine

for the employment of air forces. Doctrine is merely the reduction to tangible form of the principles which govern action. To develop a doctrine for the air force therefore, we must investigate the capabilities of aircraft in relation to the recognized principles of warfare. And it is here that the difficulty arises. The capabilities of aircraft are so indeterminate on account of the rapid strides in improvement continually in progress, that it is practically impossible to say at the present moment what aircraft can or cannot accomplish, and whether they can even accomplish under war conditions what they are well known to be capable of in suitable weather and in time of peace.

10. As an example, it has been proven by the recent experiments that selected types of aircraft, tuned up for the occasion, and carrying the largest bombs yet constructed, can under ideal weather conditions sink an old type of battleship, stationary and defenseless, not more than 100 miles from the aircraft base—*if* they drop their bombs *exactly* where they desire. But alter any of these conditions and what can the aircraft do? Can it sink a modern battleship, specially constructed to resist air attacks, maneuvering at high speed in any kind of weather, and defended by efficient anti-aircraft batteries and numerous fighting planes of its own?

11. We have considered the ideal condition for the aircraft and the ideal condition for the battleship, and in each case can be reasonably sure of the answer. But what will be the result when the conditions are neither ideal for one side nor the other? Ideal conditions for any particular weapon seldom exists in war, and we must rate the value of any weapon upon its practical ability to function successfully under actual war conditions. The battleship will run a risk when conditions are not favorable to its defense; and the aircraft, by seizing the opportunity when most of the advantages are in its favor, may be able to make a successful attack. It is under these varying probable conditions that our knowledge of what can or cannot be done is so meager, and at the present moment we cannot do much more than conjecture. However, in the present state of rivalry between nations (and no nation is without its own particular rival), one cannot afford to await the complete solution of every unsolved military problem before deciding what kind of a military force to con-

struct. One must make the best possible conjecture as to the probable value of various means of defense, and then construct these in accordance with the most probable conclusions reached.

12. To form some idea, then, as to how much one should depend upon an air force, and what should be its size and characteristics, we must consider, with the best information available, the capabilities of modern aircraft, and estimate how much these capabilities will be increased at the present rate of progress. We must then study all types of aircraft which exist at present, their capabilities as shown by past performances, and the lines of development along which progress is leading. We can thus arrive at some conclusions as to what we may reasonably expect our air force to accomplish, and form a plan for the employment of the air force in war. This should include co-operation with land and naval forces, and co-ordination of the different types of aircraft themselves in the various operations of war. In this way a doctrine is formed for the conduct of air operations, which will form the basis upon which to construct our air forces. We can then determine what size air force we shall need, and the relative proportion of the various types to produce a well balanced force.

TYPES OF AIRCRAFT

13. A complete study of aircraft would of course fill volumes, and the mass of technical detail would end by obscuring the issue. Such a study is of course not contemplated here. The principal types will merely be enumerated, with their characteristics, advantages, and disadvantages in brief; and their capabilities will be assumed from their best known performances, to give us a basis upon which to formulate a tentative doctrine for the employment of aircraft in war, and to devise a system of aerial tactics.

14. Aircraft are divided into two main classes: Lighter than air, and heavier than air. Lighter than air craft are divided into dirigibles, free balloons, and captive balloons, of which latter type the kite is the most efficient for war purposes. Dirigibles are further divided into rigid, semi-rigid and non-rigid types and are constructed in innumerable sizes, from the Baby Blimp to the Zeppelin. They all have self-contained motive power and are capable of being controlled in speed, elevation and direction. Free balloons have no motive power of their own,

but are capable of movement with the wind. They can be controlled in elevation but not in direction. Captive balloons have no motive power, and are incapable of movement, except that they can be controlled in elevation by power outside of themselves.

15. The largest dirigibles must above all have endurance and ability to keep the air under adverse conditions of weather. Their speed and climbing power are moderate. Smaller dirigibles have these qualities correspondingly decreased. Free balloons are of no practical use in war. Kite and other captive balloons are used for observation purposes and control of gunfire. They must offer a reasonably good platform and be capable of being quickly hauled down.

16. Dirigibles can operate only from the shore, and therefore cannot be counted on for reliable use with the fleet. This was demonstrated at the Battle of Jutland by the failure of the German Zeppelins, in spite of the proximity to their bases at which the action took place. Kite balloons can be used advantageously from the decks of large ships, for observation and spotting purposes, and it would seem that at least one ship in each division of capital ships should be equipped to carry them.

17. Heavier than air craft are almost infinitive in type, size, and characteristics, but can be divided according to their uses into a relatively small number of principal types. They can best be considered under the uses for which they are designed.

METHODS OF EMPLOYMENT

18. The employment of aircraft in war can be grouped into the following main divisions:

1. Securing command of the air.
2. Scouting, reconnaissance, and patrol.
   (a) Photography.
3. Fire control, observation, and spotting.
4. Protection of the fleet.
   (a) Smoke screens.
5. Attack on enemy surface and sub-surface craft.
   (a) Illumination.
   (b) Bombs, torpedoes, and guns.
   (c) Gas attacks.

6. Escort of convoys.
    (a) Submarine and mine search.
7. Dispatch carrying.
8. Transportation.
9. Evacuation of the wounded.
10. Control of operations from the air.

19. Of these the first is most important, just as it is with a fleet on the sea, and its successful accomplishment facilitates all of the other duties of aircraft listed below.

AEROPLANES WITH THE FLEET

20. There should be at least one large plane carrier with the main body and one with the principal scouting force. In addition every large ship—that is, battleships, battle cruisers and scouts—should carry one or two planes. The ideal would be of course to have enough planes on warships and plane carriers to secure indisputable control of the air, and this should be the objective striven for. Since the number of planes which can be carried on regular warships is necessarily restricted, the number of plane carriers must be increased to attain the desired end. On cruisers which carry but one plane, this should be a scouting plane. In capital ships which carry two planes, one should be an observation plane and one a combined fighter and light bomber.

21. For practical operations the proportion of types depends naturally upon the enemy's air force, and upon the actual conditions it is expected to encounter. In general, there must be enough pursuit or fighting planes to control the air in any probable situation which may arise. Each capital ship must carry its own observation or spotting plane. There must be enough scouts to keep informed of the enemy's movements. Then, the rest of the carrying space available can be given up to bombing and torpedo planes.

AUXILIARY CHARACTER OF THE AIR FORCE

22. Before considering the tactics of aircraft, it is desired to invite attention to a fact regarding the character of air forces, which it will be well to bear in mind. An air force at the present time is essentially an auxiliary force. As General Pershing states, it cannot, acting independently and on its own account, either win a war at the present time, or obtain a decision against forces on

the ground. The same may be said of the sea. Securing command of the air is thus an operation of a somewhat different character from securing command of the sea. At the present time it but facilitates the accomplishment of the preliminary operations necessary and leading up to the securing of the command of the sea. In a sea campaign, therefore, we must consider the air forces merely as any other part of the auxiliary or minor forces, such as destroyers and submarines, scouting vessels, etc.; and in no case must we invest them with the attributes of a main fighting force; which attributes the battle fleet, and it alone, possesses.

Aircraft Regarded as Projectiles

23. We might even go a step further, and instead of classifying aircraft as a part of the auxiliary forces, class them as long range projectiles. Since the range and endurance of aircraft is not sufficient to permit them to control the command of any extensive area of sea or land by themselves, they must have a base close at hand from which to operate and to which to return when their endurance is exhausted. The base may be an air station on shore or a plane carrier at sea. The air station on shore is thus analogous to a battery of high powered long range guns, and the plane carrier is analogous to the capital ship. Each is an establishment for the hurling of projectiles against the enemy.

24. Considering aircraft in this light their effect upon the tactics of warfare can be estimated. The aeroplane is nothing more than a projectile of much greater range than the shell from a heavy gun, or the torpedo; capable of being aimed and otherwise controlled during its flight, and if not destroyed, of returning to its base after its attack; but also susceptible of being intercepted and stopped during its flight before it reaches its target. The obvious tactical result of the great range of aircraft considered as projectiles is to increase tremendously the battle range between opposing forces. An air station ashore or a plane carrier at sea protected by other forces to the best possible degree from every known kind of an attack, can launch its projectiles (aircraft) against an enemy distant many times the range of visibility.

25. The controlability, however, of the aircraft projectile during flight, and its susceptibility of being intercepted, introduce new tactical elements in the employment of this method of striking the enemy. Unlike the shell and the torpedo which after leaving the gun and the tube proceed automatically toward the target unguided by human skill after the initial aim and adjustments have been made, the aircraft remains under the control of human intelligence until it delivers its attack, is destroyed, or driven off. The enemy also sends out similar weapons under the same kind of control to prevent it from accomplishing its mission. What is really a battle of projectiles then ensues to determine whether the target shall be reached or not.

PLANE CARRIERS AS CAPITAL SHIPS

26. The greatly enhanced importance of the plane carrier becomes obvious, viewed however not as an element designed solely to facilitate the acquisition of the command of the air, but rather as a capital ship of the sea fleet carrying projectiles for attacking the enemy's main force far outranging those of the present battleship. In other words, aerial development will have the effect of adding a new type of capital ship to the sea fleet. In order to use this type the command of the sea is still of vital importance.

27. From its very nature and the requirements of the aircraft which it is to launch as projectiles, this new type of ship—the plane carrier—will not be able to defend itself against the attack of hostile battleships. Just as a battery of heavy artillery on shore must be protected against capture by the employment of light artillery, machine guns, and trench mortars, so must the plane carrier at sea be protected from enemy surface craft by battleships and other sea types.

28. The ideal of course would be to combine the plane carrier and the battleship into one all powerful vessel, with the ability to gain command of both sea and air. As this is obviously impossible we must recognize the advent of the new type of capital ship without discarding the old, and the backbone of the modern fleet will consist of both types—the plane carrier and the battleship. Just as the battleship was formerly the target for attacks by destroyers and submarines, so now the plane carrier and battle-

ship will be subject to these attacks and, in addition, to the attacks of aircraft. It cannot be seen from present accomplishments, that the broad principles of naval warfare have been upset, but merely that the tactics have been altered by the introduction of a projectile of very much greater range and controlability, and the opening up of the third dimension to hostile operations.

29. The recent experiments against the old *Alabama* of the American navy show up much that is startling in the possibilities of poisonous gases, flares, and smoke screens launched by aircraft against surface craft; but it must be remembered that these were conducted against an inert target; just as the former experiments against the old German ships were. Undoubtedly the side which gains complete command of the air can inflict terrific punishment upon its adversary, but the same may be said of the side which formerly had gained undisputed command of the sea. In the future, command of the sea and command of the air must go hand in hand, and until aircraft as stable and of as great endurance as seacraft are developed, it is difficult to see how either can be gained or maintained without the presence of a sea fleet.

30. Furthermore, even if it is granted that aircraft can safely protect the entire coast and hold seacraft at a distance of 200 miles therefrom, as has been claimed, this is purely a defensive measure. To win, offensive tactics must be pursued. How can aircraft by themselves carry the war to the enemy's coasts, maybe thousands of miles away? It is inconceivable that they can, without the escort and support of a sea fleet. This fleet must be of the most powerful and include battleships, or it can be destroyed if the enemy has more powerful ships to send against it. In any way that the subject is approached, it is impossible to get away from the absolute need of the battleship as the backbone and main support of all other types of craft designed to fight on, under, or over the sea.

NATURE AND CONTROL OF THE AIR

31. Securing command of the air, then, is an operation analogous to an action between the light surface forces of opposing fleets to get local command of such area as to permit of driving home a reconnaissance, of carrying on distant scouting, or to

facilitate minor attacks upon the enemy main force. It is for these same reasons that command of the air is sought. The advent of aircraft has merely opened up another plane for the conduct of hostile operations, just as the development of submarines did. And no more than did the submarine, can the aircraft take the power of decision away from the heavy fighting units of the surface fleet. When a submarine battleship is developed, the power of decision may pass to it from the surface battleship. So also when an aircraft of equal power, endurance and stability to the surface battleship is developed, the obtaining of a decision may be transferred from the surface of the land and sea to the air. Such an event is for the far distant future, if ever; and until that time, we are not justified in considering air forces as anything more than auxiliaries and adjuncts to the fighting forces of land and sea.

32. Thus far the mission of aircraft is to assist the naval and military forces in the accomplishment of their missions rather than the accomplishment of any major operations of their own. With this clearly in mind we are in position to develop the tactical use of aircraft and show how they can be of the greatest use in the conduct of war. The first use to which aircraft would probably be put in war would be scouting and reconnaissance. But just as the light surface forces must secure the local command of a definite sea area in order to do effective scouting and drive home their reconnaissances, so must the aircraft secure at least a temporary command of the air in the locality where their scouting operations will take place. We may then well begin with a consideration of the first of the enumerated uses of aircraft in war, not only because it is the most important, but also because at least to a limited degree it is the first use to which they will be put.

SECURING COMMAND OF THE AIR

33. To secure command of the air, the enemy's aircraft must be destroyed or driven out of the air. To accomplish this an adequate number of planes of high speed, great offensive power against any type of enemy aircraft which they may encounter, and comparative invulnerability, in whatever manner this is secured, must be employed.

34. These requirements resulted in the development during and since the Great War, of a type of plane known as the pursuit or fighting plane. Its general characteristics are briefly as follows. It must have speed from 120 to 160 miles per hour, and in the future probably these speeds must be increased. It must carry as many weapons as possible to inflict damage upon the enemy. At present two to four machine guns are carried, the number being limited by size and other considerations necessary to obtain the remaining requirements. There is at present no need for more or larger guns, since its antagonists are entirely vulnerable to the present weapons. As defensive qualities are improved, however, the near future may well require fighting planes to carry three-inch guns or even larger. To secure an advantageous position from which to attack it must have great climbing ability. In the past this has been between 9,000 to 12,500 feet in ten minutes. It must be able to outclimb any other type of machine which it may encounter. For the same reason, and to attain invulnerability through its power to elude, it must be a quick maneuverer. This sets a limit to its size, which in turn offers a smaller target to the enemy. The spread of wings thus usually runs from thirty to forty feet, which makes it one of the smallest machines used for war purposes. It carries a crew of one or two men, but possible future development of its armament may require more.

35. As to the broad tactics of fighting planes, they should be sent out in large numbers upon arriving in a region where it is expected to encounter hostile aircraft. If these latter are actually in sight, the fighting planes should be sent out in advance of any other type to drive them away. Otherwise, they should follow up the scouting planes, whose radius of action is much greater, and be in position to support them if they are driven in. Their mission is essentially to secure command of the air and to support and protect all other types of aircraft and surface craft as well, against the attack of hostile aircraft. Their tactics in co-operation with other types will be considered in connection with the uses to which these other types are put.

36. Their combat tactics have heretofore varied almost with the whim of the individual pilots. Each ace and famous birdman of the recent war had his own particular style and method

of fighting. It is about time that some approved principles for combat in the air became crystalized. In general the tactics consisted in maneuvering to bring the opponent under a quick intense burst of machine gun fire while keeping out of the arc of his fire. The maneuvers obviously depend upon the number and type of guns in the opposing aircraft, and the method of mounting these. The propeller is the greatest factor tending to limit the arc of fire. Guns cannot fire through the propeller unless they are synchronized with it or fire through the propeller shaft. In these cases the guns are fixed and can only be aimed by pointing the craft itself, which necessarily greatly hampers its possible maneuvers.

37. During the recent war, fighting planes carried only one or two small guns and the methods of mounting these were very much restricted. This will be referred to later. With development, particularly in the size of aeroplanes and in the various methods devised to eliminate dead angles, it is pretty certain that in the future, fighting aircraft will have guns so mounted as to cover all arcs. The problem will be to devise a system of mounting capable of delivering the maximum fire in all directions, just as the center line turret system does for ships. Until aeroplanes are armored, there would seem to be no reason for carrying anything larger than machine guns for use against other aircraft; but recent developments indicate the feasibility of mounting cannon up to as large as three-inch. For the present these would only be used against ships or ground forces, and will be referred to later.

SCOUTING, RECONNAISSANCE, AND PATROL

38. The first use to which aircraft were put in war was scouting and this still remains one of the most important. Aircraft are the eyes of the fleet to a much greater extent than surface scouting craft can be, and are used in two ways. First, small short-range machines flown from the decks of scouting vessels themselves to increase the scouting area covered by the latter; and second, large long-range machines flown from specially constructed carriers, or from bases on shore, for independent distant scouting and reconnaissance.

39. When flown from scouting vessels planes are used either to cover the area between the vessels of a scouting line, thus permitting the distance between these to be increased, and extending the area searched laterally; or they can be sent out at daylight and before dark to cover additional areas backward and forward in the direction of the course of the scouting vessel, thus increasing the area searched along the axis of the search. The range of vision of aircraft varies of course widely according to atmospheric conditions, as well as does their visibility from other craft. Cases are known of their having seen ships at sea clearly for thirty miles, and the smoke of large cities at ninety miles; whereas at times while spotting from directly over a target, they could not see the firing ship at all due to peculiar haze conditions, although the latter could see the target.

40. Most of these atmospheric conditions affect scouting vessels as well as aircraft, and the conduct of a search must be altered to suit them. Often there is a haze at moderate altitudes whereas there is none on the surface of the sea and vice versa, and advantage must be taken of the best existing visibility. The visibility of aircraft from other craft depends as much upon the light conditions, direction of the sun, background, etc., as upon the haziness of the atmosphere. Since scouting aircraft should if possible keep themselves concealed from the enemy, advantage may be taken by a skillful pilot of different combinations of weather conditions to see without being seen.

41. As to the tactics of small scouting planes, there is not much to be said. They must of course elude or retire before fighting planes and other types more powerful than themselves. The chief care should be to scout the assigned areas thoroughly, leaving no unsearched spots; and to this end as well as in order to be able to pick up the mother ships again, the greatest attention must be paid to their navigation. For long distance independent scouting, aircraft are far superior under good weather conditions to surface vessels, on account of their greater speed and vision, which enables them to cover an area many times larger than a surface vessel can do in the same time. Sea planes are in existence with a radius of 1,200 miles. With a speed of sixty miles an hour or more, it is easy to see what immense areas can be covered in a few hours, which it would take surface vessels days to get

over in addition to the complications introduced by periods of darkness. Dirigibles are especially adapted to this work on account of their very great radius of action. But they are visible long distances, are extremely vulnerable, and cannot be employed in the face of effective aerial opposition, at least not until the use of helium or some other non-inflammable substitute for hydrogen is found practicable, and some form of protection against gunfire developed. Large dirigibles, also, can only be employed within radius of their bases, and hence are unavailable to a fleet on a long distance oversea expedition until some sort of an operating base for them is captured. They are moreover very liable to be disabled by adverse weather conditions.

42. Of course in all distant scouting the difficulties of aerial navigation must be thoroughly appreciated. On account of air currents whose force and direction is unknown and which differ at different altitudes, dead reckoning is of practically no use. Astronomical observations are difficult to take and untrustworthy, due to the inaccuracy of estimating the height of the eye, and the discomfort and exposure of the observer. Navigation by landmarks, akin to coastal navigation, is the only thoroughly reliable method, and of course this is not available when out of sight of land.

43. In general, the same methods of search available to surface craft are at the disposal of aircraft; but due to the difficulties of navigation mentioned above, complicated schemes involving the various methods of the retiring search curve should not be attempted. Only the simplest forms of search, involving direct courses, should be tried; and if not in sight of land, the position should be checked as frequently as possible by sighting surface vessels from whom accurate positions can be obtained by radio. After the existing weather conditions as to wind currents at various altitudes, etc., have been determined by a series of short observation flights, the planes should be sent off by squadrons in sufficient number to completely cover the desired area. The plan of the search, including the exact position of the starting point, its extent, courses to be followed, etc., should be carefully made in advance, as well as a summary of the information it is desired to collect. If it is expected to encounter aerial opposition at not too great a distance, the scouting planes must be preceded or followed and supported by fighting planes.

44. The tactics of scouting planes on a search should be very much like that of the light scouting forces of the sea fleet. Depending on the character of their immediate mission and its urgency, they must be prepared to fight for their information, and if there is a good chance to pierce the enemy's aerial screen they should not hesitate to do so. If opposed by too great force they must retire upon their fighting planes in the same manner that light scouting vessels retire upon their supporting force. When sufficient power has been concentrated another attempt should be made to pierce the hostile air screen. So much for operations within the radius of action of fighting planes, which is small.

45. There is this difference between aerial and surface scouts, however. While the surface scout is usually faster than its supporting force and than the enemy vessels powerful enough to destroy it, the reverse is the case in the air. The so-called scouting plane has a large radius, but a comparatively low speed; whereas the fighting or pursuit plane has a small radius but high speed. This precludes the escape of a scouting plane discovered by enemy fighting planes out of supporting distance of its own fighting planes. Its tactics while scouting beyond the radius of its own fighting planes must therefore be quite different from that of surface scouts. It must depend upon concealment for safety. Since planes can see and obtain valuable information much farther than they can be seen, they can approach enemy positions or vessels with comparative impunity. If their presence is not suspected, only a sudden chance contact with enemy fighting planes can imperil them; since it would be impracticable for the enemy to keep a continuous patrol in the air with such short distance between units as to insure the discovery of every approaching hostile aircraft.

46. The tactics of slow long distance scouts thus reduces itself to concealment, and the pilot must be expert in taking advantage of weather conditions to remain unseen and yet be able to see himself. In clear weather, scouting at high altitudes, with great distance between planes of a scouting line, covers the greatest area in search for surface craft. In searching for submarines the altitude ought not to be over 1,000 feet and the distance between planes a few thousand yards. It is often necessary to come down if the visibility is poor, or in order to get under clouds, and some-

times it is necessary to rise over a rain squall in order to maintain vision all around it.

47. Fog of course puts an end to all search, just as it does for surface craft; and in addition may cause the plane to get lost. Fog should therefore never be entered if it can be avoided. If it cannot be kept clear of, a landing should be made before it closes in, if possible. If it is necessary to continue flying through fog, snow, or heavy rain, different altitudes previously agreed upon and differing by at least 500 feet should be taken by the planes of a scouting line to prevent collisions. Scouting at night is useless just as for ships, except to gain information of what is going on at some fixed positions where activities are in progress under bright artificial light. Under these conditions planes can come down very low without fear of being seen. The danger is of being heard, but this also is minimized if the industrial activity is such as to produce sufficient other noises to drown the noise of the plane's exhaust.

48. In approaching hostile positions or vessels, the direction of approach should be carefully chosen as regards sun, background, silhouette, etc., if the direction of the wind and other governing conditions permit. The NC-4 in approaching Lisbon on its flight across the Atlantic, is said to have been picked up at a distance of about twenty miles, being silhouetted against a western sky at sunset. High land or low cloud backgrounds, sun-glare and haze, render planes very difficult to pick up, just as they do ships.

49. So much for visibility. Audibility is almost as dangerous in disclosing the presence of aircraft and the potent factor is of course the motor exhaust. It can be somewhat deadened by approaching up the wind, but until it is found practicable to muffle the exhaust of aeroplane engines, this will continue to be a give away of an aircraft's presence.

50. For reconnaissance, as distinguished from scouting, dirigibles are best suited, on account of their ability to stop and hover over one spot while details are observed. It is evident how incomparably more accurate such a reconnaissance would be in regard to such details as size of guns, contours of defensive works, roadways, relative distances and directions, etc., especially if camouflage is employed; than a reconnaissance depending upon

the fleeting glimpses from an aeroplane darting over the locality. For long distance reconnaissance beyond the radius of aeroplanes, dirigibles are the only available aircraft. Their vulnerability, however, must be constantly kept in mind. They cannot be used where aeroplanes will be encountered in force.

51. In the recent war, photography from aircraft was much used. Both plane and dirigible can be equipped for this service, but the former is probably the more efficient as it can work faster, thus enabling it to take a series of photographs of any desired area, and views of the same object from different angles, much more rapidly than dirigibles.

52. Patrol may be regarded as a form of scouting, usually in the vicinity of one's own force or bases, to insure the early discovery of the approach of enemy forces. The patrol of such areas should be systematic and regular, constituting a part of the daily routine. For this use planes should have good endurance at cruising speed, and high speed is not essential. Small dirigibles can be used advantageously.

Fire Control, Observation, and Spotting

53. The use of aircraft for fire control, observation, and spotting will next be considered. For these uses several types of aircraft are employed,—the kite, the dirigible, and the aeroplane; and there can be no question that the efficiency of fire controlled from aircraft is immeasurably superior to that controlled from a position on board the ship. Spotting from shipboard cannot be accurate at ranges of more than 18,000 to 20,000 yards; whereas from aircraft, spotting is efficient up to the maximum range of any naval gun yet developed, and the fall of shot at any range can be observed far more accurately than from the ship. Furthermore aircraft are not interfered with by the blasts of the guns, vibration, spray, the enemy's fire, and other confusing local conditions on board ship. They can spot over smoke screens, low lying mist, and beyond the horizon as seen from the ship. Except the kites, they can take position so as not to be affected by funnel smoke and gases, and sun-glare.

54. Kite balloons have the great advantage of direct telephone communication with the ship, but their many disadvantages outweigh this. They give away the exact location of the ship,

which otherwise might be obscured by smoke, mist, etc. They hamper the handling of the ship, require considerable attention from those on board, and in case of being shot down might add immeasurably to the general wreckage. They have a bad whip when salvos are fired and are thus not as good spotting platforms as other aircraft. Above all their position can only be varied in height, and they cannot thus seek the best positions for observation as other types can. They are subject to much of the same interference as the ship spotters. They cannot be used in bad weather and are very vulnerable to attack by hostile aircraft.

55. Dirigibles are in many respects the best type of aircraft for fire control. They make good platforms and are roomy and commodious for the observing personnel. They can slow down and stop, thus maintaining themselves in the best position for observation, whereas planes must keep moving at high speed. But they are susceptible to bad weather and are very vulnerable to air attack, as well as furnishing a large target for the gunfire of ships. Worst of all they cannot be counted upon as always available, since they cannot accompany a fleet at sea indefinitely, but can only operate within their radius of action from some fixed base on shore. Thus the dirigibles may not be present when most needed, if it happens that the theater of operations does not contain a dirigible base within radius of action of where the opposing fleets make contact.

56. Planes are therefore probably the most reliable and dependable type of aircraft for spotting purposes. They can go up in almost any kind of weather, are better spotting platforms than kites, and have all the advantages conferred upon them by mobility in selection of position for observation, etc. They can, before the action begins, report the movements of the enemy over the horizon or behind smoke screens, thus permitting fire to be opened at the earliest practicable moment. This is important with the modern long range gun, which can fire much further than its shots can be accurately spotted from the ship. The great disadvantage of planes which is not shared by kites and dirigibles, is that they must keep going at high speed throughout the entire time they are spotting, which in a prolonged action when reliefs cannot be furnished, subjects the personnel to great strain.

57. Kite balloons are so restricted as to action that there is not much room for a choice of tactics. They stay on the job as

long as possible and can vary their altitude somewhat to secure the best conditions for observers. But other than that they are helpless and defenseless. Dirigibles should keep in the vicinity but well above the firing ship. They must of course keep entirely clear of the trajectory of the projectiles, as must also planes, and cannot therefore go very far between the firing ship and the target. To fly over the target would be too hazardous in view of their vulnerability. If attacked they must take such steps to beat off the attack or make their escape as they would under any other circumstances, without, unless unavoidable, leaving their station until some other means of spotting can be resorted to, and for as short a time as possible. Defense should generally be left to friendly fighting planes.

58. The tactics of planes in spotting, which have so much greater freedom of action than the other types of aircraft, are more capable of elaboration. Their first care must be to keep in such position that the observer can see the target uninterruptedly, unobstructed by the interposition of wings, tail, etc. The altitude should in general be from 1,000 to 5,000 feet so as to obtain the best visibility conditions. They must keep out of the trajectory of the projectiles. As the maximum ordinate of the 14"/50 caliber gun is nearly 5,000 feet, at 20,000 yards range, and over 7,000 feet at 25,000 yards, the danger can be seen of getting midway between firing ship and target. To take position over the target would expose the plane to destruction by hostile action, and possibly prevent its getting back in case of need, through the trajectory of the guns of its own side. It is best therefore to remain in the vicinity of the firing ship, and maneuver to pass over it, flying towards the target at the instant the first salvo is fired. The plane should then turn at right angles and fly back and forth in front of the firing ship in a sort of figure 8, always turning toward the target so the observer will not lose sight of it. As each salvo is fired the pilot must turn the nose of the machine slightly toward the target so as to prevent the observer's vision from being obscured by a wing.

59. Primary communication except in the case of kites is by radio telephone. The plane should be warned before the first salvo and thereafter the word "fire" sent out at the instant of firing. Visual signals constitute the secondary system of com-

munication. Flags or streamers are used, different colored smoke puffs, or prearranged maneuvers of the plane itself. The secondary systems are slow and not very flexible, but the radio telephone is quick and accurate and the corrections from a plane should be in as soon as the ship spotter's.

60. There is a type of aircraft thus far little developed which has the promise of being an ideal machine for fire control and observation. This is the helicopter. With propellers of sufficient lifting power and for motion in horizontal translation, the helicopter could make headway or hold its own against the wind, and thus remain stationary in midair or move to any desired point. Such a type would have all of the combined advantages of the plane, the dirigible, and the kite, with practically none of their disadvantages. In addition to its ability to hover, its chief advantages are the ease with which it can be handled from the deck of a ship, especially as compared to the cumbersome kite or dirigible; the absence of the inflammable gas essential to these two types; and its invisibility and invulnerability as compared to them.

PROTECTION OF THE FLEET

61. The fourth use for aircraft to be considered is the protection of the fleet. Protection may be considered under two heads: warning of the approach of hostile craft of the air, sea or sub-sea; and the destruction or driving off of such craft. The types of aircraft needed for warning will be different from those needed to destroy or drive off the enemy. And also, the types needed to combat hostile aircraft will be different from those needed to combat surface craft or submarines. In fact, for the task of protecting the fleet practically all types of aircraft will be needed. The various duties of the protective force and the types needed for each will now be considered.

62. For protective scouting, planes can be used to a limited extent, but dirigibles are more efficient on account of their ability to remain in the air for much longer periods, and to stop and regulate their speed more easily to that of the fleet. The difficulty of maintaining large rigid dirigibles with the fleet far from their shore bases would practically preclude them from this duty. Small non-rigid types such as the Baby Blimp would be good craft for this work, provided the problem could be solved of

caring for them. This use of dirigibles as protective scouts is merely suggested as a possibility of the future. If their value in this capacity is thought to be sufficient, the problems involved might be found possible of solution. Or a new type, intermediate between the plane and the non-rigid, might be developed possessing some of the ease of handling of the former with the endurance and stability in the air of the latter.

63. In any case it cannot be seen that dirigibles possess any great advantages over surface craft for protective scouting, except speed and greater radius of vision due to their higher altitude. They would be efficient for picking up enemy surface craft; but since they can be seen by submarines much further than they can see them, no submarine would have any difficulty in keeping out of their sight by submerging. While it is true that they can see below the surface under certain conditions, deeper than surface craft, this distance is very limited even under the best conditions on the high seas, and submarines can always avoid detection by submerging deeply enough. Against aeroplanes they would be helpless since the latter are greatly their superiors in speed and invulnerability. From such distance as they could see hostile aeroplanes they could be overtaken and destroyed before they could either get back to the protection of their own forces or be supported by their own fighting planes, unless these were present with them; in which case they could as well do the scouting themselves and there would be no need of the dirigibles at all.

64. For gaining information of the presence of submarines, hearing must be depended upon rather than sight. The listening devices of surface craft are the best although not a certain means of detecting submarines. In this respect ships are superior to aircraft for protective scouting against submarines; and since dirigibles are helpless against enemy aeroplanes, the only advantage they possess over ships for protective scouting in general is the greater distance they can see enemy surface craft. This advantage is hardly sufficient to warrant the risk of loss attending their use, and hardly worth the trouble of overcoming all the difficulties and problems connected with maintaining them with the fleet.

65. For protective scouting by air forces we must therefore depend upon the plane, and since these cannot keep the air in-

definitely, the best that can be done is to send them out periodically, say at dawn and at dusk. They can thus cover the day and night circles of the fleet, and can at least insure that no surface craft are within striking distance. The discovery of submarines would be pure luck, and aircraft can run in so rapidly that they cannot guarantee the fleet against their undetected approach. So much for the first duty of aircraft in the protection of the fleet.

66. Now as to their ability to drive off or destroy attacking hostile craft. Against surface and sub-surface craft, bombing planes would be the chief reliance. Against surface craft only, there may be added torpedo planes and fighting planes heavily armed with guns. The employment and tactics of these will be discussed under the next subject. Suffice it to say here that for the adequate protection of the fleet, there must be kept ready for instant flight as many as possible of all these types of planes.

67. Before leaving the subject a word will be said regarding smoke screens in connection with protective scouting, and the possibilities of aircraft in relation to them. It has already been mentioned that aircraft can spot over smoke screens which would be impenetrable to observers on surface craft. So also in observing in connection with protective scouting, aircraft can develop what lies beyond smoke screens laid by the enemy to hide their movements in proximity to the fleet. Information as to the types and number of ships, formations, courses and speeds, and changes of these, can be sent with speed and accuracy to a commander-in-chief blinded by smoke or separated from the hostile forces by an impenetrable pall. Radio telephones would of course be used to transmit this information, as long as they were available.

68. Aircraft dropping smoke bombs can with efficiency and despatch lay smoke screens as designated by the commander-in-chief much more easily and quickly than the same can be done by the comparatively slow movements of surface craft—even destroyers. The fleet could be thus hidden from the approach of hostile craft; or after discovery can be shut out of view while changes in dispositions are made. Hostile air attacks can conceivably be broken up in this manner, by exploding smoke bombs at altitudes which possibly could not be reached by the smoke screens of surface craft.

ATTACK ON ENEMY SURFACE AND SUB-SURFACE CRAFT

69. The fifth use which will be considered is attack on enemy surface and sub-surface craft by air forces. For this, three different weapons are available: the bomb, the torpedo, and the gun. Each of these is best carried by a special type of aeroplane, but they are to a certain extent interchangeable. It has been demonstrated by the recent American experiments off the Virginia Capes that any ship at present in existence can be sunk if enough bombs of adequate size can be placed upon or around her as desired. Bombs up to 2,000 pounds were used and there are at present in existence, bombs of double that weight. The greatest effect from bombs seems to be obtained not by direct hits but by dropping them close alongside the target, where the action is the same as that of a submarine mine.

70. The advocates of the aeroplane are enthusiastic in their predictions of what they will be able to accomplish in future wars, while the adherents of the battleship are by no means hopeless of being able to meet the peril. So much on both sides has been written and made public, including the official report of the Joint Army and Navy Board, upon the experiments, that it is not purposed to discuss here the pros and cons. It is sufficient to know that a new and very promising method of conducting hostilities on the seas has made its appearance, and constitutes a grave menace to the safety of surface fleets. An attempt will be made to indicate briefly the lines which the development of this new mode of attack will take and the means which should be taken to meet it.

71. When a hostile fleet is discovered and its position reported within flying distance of air stations either ashore or afloat, the forces must in the future be considered to be not only in tactical contact, but within range of each other's projectiles. Heretofore it has been of vital importance to open fire at the maximum range at which it is thought that hits can be made with the guns, and the difference of a few minutes has been sufficient to give the side which lands the first salvos a tremendous if not a decided initial advantage. So much was this appreciated that in the naval actions between the British and Germans in the recent war, fire was opened practically simultaneously. Applying the same principles to the use of aircraft it will be of vital importance to land the first bombs upon the enemy's fleet. This will put the same premium

upon increasing the flying radius of bombing planes as was put upon increasing the range of guns, and every effort will be made to get in the first air attack.

72. It is hardly to be supposed that a fleet will approach a hostile coast protected by aircraft, without having command of the air. We shall therefore eliminate this case and confine our attention to that of two fleets approaching striking distance of each other, outside of flying distance from any shore stations. Each will probably strive to deliver the first air attack, just as formerly each tried to land the first gun salvo. But there is a difference in the two cases. The ability to land the first gun salvo depends only upon the range of the guns, and the skill of the personnel in handling them. The ability to land the first bomb depends upon the ability to force home the attack against hostile resistance, much as destroyer or submarine attacks would be made prior to a major action. Means must be provided therefore to break down any resistance encountered. Since the effect of anti-aircraft batteries is practically negligible, the resistance to be reckoned with will be in the air. To overcome this, fighting planes must be sent out in advance to secure temporary and local command of the air. In view of the importance of making the bomb attack as early as possible, the bombing planes will follow close upon the fighting planes, or even accompany them and slip through the hostile fighters while the attention of these is fully engaged.

73. If the opposing air forces are strong and evenly matched, neither side can hope to secure undisputed command of the air for some time, and advantage must be taken of every opportunity to break through. Air attacks must follow each other as frequently and in as great force as the number of planes available and the results of previous engagements in the air permit. The bombing planes must be sent out in squadrons as large as possible, to secure what corresponds in gunnery to volume fire; protected by all available fighting planes. To pursue the analogy, rapidity of fire with guns would have its counterpart in the rapidity with which the squadrons could follow each other out. The destruction of planes before they reached the target would in the same way correspond to the silencing of guns on board shi .

74. The details of the attack and the manner of delivering it must be left to the flight commanders and the individual pilots in the same manner that it is left to flotilla and commanding officers of destroyers. The manner of approaching the target and of releasing the bombs, with allowance for wind, speed, drift, bomb trajectory due to its coefficient of form and specific gravity, etc., is a matter of training and instruction, rather than of tactics, and will not be discussed here.

75. Thus far no assumption has been made as to daylight or darkness, but the foregoing remarks apply chiefly to daylight conditions. Provided the target can be found, darkness offers much greater chances of success to bombing aircraft than daylight. But even if the position of the enemy's fleet was accurately known at dusk, which is all that can reasonably be expected, drastic changes of course and speed in addition to the fact of its being darkened, will make its discovery from aircraft a very difficult matter. Add to this the well-known difficulties of aerial navigation on trips of any distance, enhanced by darkness, as well as the difficulty of keeping other planes of the attacking formation in sight, and some idea can be formed of the obstacles which will be encountered by the attacking planes.

76. If the movements of the enemy fleet have been closely followed after dark by scouting planes or other means, and its position can be predicted within narrow enough limits at the moment the air attack is to develop, much of the bombing plane's difficulty disappears. With good weather conditions—that is a clear night, preferably moonlight with a wind whose force and direction can be counted on to hold—planes should be able to locate a hostile fleet sufficiently closely to disclose it by means of parachute flares.

77. Prior to the armistice, flares of 2,000 candle-power supported by eighteen-foot parachutes were constructed which burned up to eleven minutes. Since then flares have been developed of 200,000 candle-power capable of illuminating an area five miles in diameter and of making it as clear as day. The construction of flares of 1,000,000 candle-power is planned. The parachute screens all space above it and reflects the light downward so that the planes can operate unseen in the gloom above while everything on the surface of the sea is clearly disclosed.

78. A night attack upon a fleet would be conducted by sending out in advance a number of planes to drop parachute bombs over and around the hostile ships. These would be closely followed by the bombing planes, which, having picked their targets by the light of the flares, could attack them either before or immediately after the flares became extinguished. It is thought that the bombing planes would be in no very great danger even if they attacked in the light of the flares. Since the whole attack would be in the nature of a surprise, the anti-aircraft batteries would be of little use and the protecting planes would not have time to take the air. If they attacked after the flares had expired, they could fly down in the darkness as low as they desired so as to be certain that each bomb reached its mark.

79. The defense against such an attack would at best be haphazard on account of the difficulty of finding planes in the vast space of darkness, by the uncertain aid of searchlights or star shells fired at random. The best, if not the only defense against such an attack would be the putting out of action of the enemy's plane carriers from which the attack would emanate, before darkness set in.

TYPES OF BOMBS

80. Various types and sizes of bombs are available for use from aircraft. First, demolition bombs weighing from 25 to 4,000 pounds, loaded with high explosive comprising more than fifty per cent of their total weight. These are primarily for the destruction of material, but incidentally destroy personnel as well. Second, numerous kinds of asphyxiating, poisonous, and tear gas bombs, designed for exerting different effects. These are for use solely against the personnel, some of which kill outright, while others produce temporary blindness, asphyxiation, etc. It is expected that the fumes of these bombs will enter the ventilating ducts of the ship and permanently or temporarily disable all the personnel in artificially ventilated compartments, as well as those on open decks within considerable radius of the explosion. These bombs may thus do more to put a ship out of action than the direct but more or less localized destruction caused by demolition bombs.

81. Finally, there are smoke bombs designed either to shroud the ship in a pall from which nothing can be seen, or as a smoke

screen through which air and surface torpedo craft can attack. The effect of all these bombs has been so well demonstrated in the recent American experiments upon the ex-German warships and the *Alabama*, so completely reported upon, and so thoroughly discussed, that nothing further can be added here; and those interested are referred to the official reports upon the tests.

Torpedoes in Aeroplanes

82. We shall pass on then to the consideration of the next weapon available to the aircraft—the automobile torpedo. At first sight this appears to be a formidable weapon, but both the weapon itself and its mode of handling from aircraft present certain difficulties. First as to the weapon itself. To begin with, a large proportion of the weight of a torpedo is taken up by the air flask, machinery, tail, etc. This is of no destructive effect. Hence the useful load as regards destructive power of the torpedo is small compared to the useful load of the bomb. The weight of the explosive is only about twenty per cent of the total weight of the torpedo; whereas in the case of the bomb the weight of the explosive is fifty per cent or more of its total weight. Comparing a bomb and a torpedo of the same weight, the former has two and one half times as much explosive as the latter. This is of course partly made up for by the fact that in the case of the torpedo the explosion, if it occurs at all, is in direct contact with the hull of the ship; whereas with the bomb, it is at a distance corresponding to the skill with which it is dropped.

83. The mine effect is thought to be the greatest which can be produced by a bomb. A direct hit of a bomb may do terrific local damage, but would probably not endanger the stability of the ship to as great an extent as a hit of a torpedo carrying the same weight of explosive. To secure the same effect a bomb must be dropped exactly alongside. But two and one half times as much explosive can be carried in the form of bombs as torpedoes. If this is carried in two bombs, there are double the chances of placing one so as to do as much damage as the torpedo. At present no attempt can be made at figuring out the relative chances of making hits with bombs or torpedoes.

84. In the next place the structural defense against underwater explosion is being vastly improved as a result of the

recent war, and the future dreadnaught may be less vulnerable to under-water attack than attack from the air. It is however to be expected that steps will be taken to protect ships against attacks from the air as well, and it is impossible to say which will be the more effective until it is known what protection will be embodied in the future ships against each. At present it would seem that both weapons have possibilities warranting development, and skill in the use of each should be striven for.

85. Now as to the mode of handling torpedoes from aircraft. The latter must come down to within twenty feet of the water in order to successfully launch a torpedo. Too great a height or speed of plane will result in damage to or derangement of the torpedo which will prevent its running. Now, when a plane comes down to fire a torpedo in this manner, it deprives itself for the time being of one of its greatest assets—the ability to maneuver in the third dimension. It reduces itself temporarily to practically the limitations of a surface craft, except as to speed. It becomes exposed to the same danger of being picked up, and to the rapid fire of secondary batteries, in the same manner as surface torpedo craft; but the plane is much more vulnerable, not only to direct hits by the fragmentation of shrapnel, but to splashes, which would wreck it by tearing its wings, rudders, and stabilizers to pieces. An effective splash barrage laid just ahead of attacking torpedo planes would probably prevent their passage, even if light metal were substituted for fabric in their construction.

86. Another disadvantage of the torpedo is its relatively slow speed. The plane can reach the target quicker than the torpedo which it launches. One naturally asks then, why not have the plane continue its flight and attack the ship with bombs from a relatively safe altitude, instead of using torpedoes at all, from a dangerously low level? The possibility suggests itself of the development of an aerial torpedo which would be more accurate than the bomb, and have none of the limitations of the water torpedo.

87. However, let us consider the tactics of the torpedo plane and its weapon as they at present exist. Having reduced itself, except in the matter of speed, to the status of the surface torpedo craft, it must attack in much the same way as the latter. Its

greatest chance of success would be at night, or through smoke screens. The attack should be delivered in divisions or squadrons of planes from the most advantageous angles for making hits, provided the force and direction of the wind are not governing factors in the handling of the planes themselves and the laying of the smoke screens. The screen can probably be best laid by a squadron of aeroplanes carrying smoke bombs, and co-operation between these and the torpedo planes must be worked out in advance to prevent collisions, interference, etc., as well as the method of retirement of both types. The manner of delivering the attack must be left to the flight commanders and pilots just as in the bomb attack. Incidentally it may be remarked that much difficulty must be expected in estimating from aircraft at night the course, speed, and range of the target vessel.

GUNS ON AIRCRAFT

88. The third weapon available for attack on ships is the gun. During the Great War only machine guns were used, each fighting plane carrying two: one mounted on the upper wing, and one in front of the pilot. The Lewis gun was the type used practically exclusively by the Allies on the upper wings; and, after synchronizing gear was invented for firing through the propeller, the Vickers was standardized for this kind of fire and used to the exclusion of all others. The latest practice is to use both of these types of guns in pairs, in twin mounts, in order to double the volume of fire.

89. More recently one and three pounder automatic cannon have been mounted, and a three-inch semi-automatic for use on aircraft is being constructed. These guns will greatly increase the offensive power of aircraft against the fire control tops, bridges, upper works, and exposed personnel of ships. They will be particularly effective against destroyers, whose personnel is absolutely exposed, whose light decks and side plating could be completely riddled, and whose anti-aircraft defense is necessarily feeble.

90. For use solely against personnel—landing forces in open boats or on beaches, troops in trenches or on the march, and columns of troops and transport on congested roads—the latest development is the Larsen all-metal plane. It has a speed of

140 miles an hour and carries thirty machine guns of 45-cal. These are mounted along the bottom of the fuselage so as to fire directly down. Each gun fires at the rate of 1,500 shots per minute, or 45,000 shots per minute, total rate. The effect of such a blast upon the open decks of lightly protected vessels can be imagined; but their principal use is against troops, and they would be very valuable in repelling a hostile landing.

ESCORT

91. The fifth use of aircraft is for the escort of surface ships. This includes both the escort of fighting ships and of convoys, and is primarily for defense against submarines, although it would also be effective against hostile aircraft. In the future, every battle fleet and scouting detachment will, where conditions require it, doubtless have its screening force of aircraft similar to its screening force of destroyers. But the air escort will be particularly valuable for convoys through submarine waters; and it was for this purpose that it was used with great success in the recent war, along the coast of England, in the Channel, and on the coast of France.

92. When escorted by aircraft there were almost no cases of attack on convoys by submarines, and hardly a sinking while the aircraft were in the air ready for duty. German submarines always submerged when a plane was discovered. The tactics of aircraft were to bomb the submarine if possible, but in any case to drive it under at such a distance from the convoy that with its low submerged speed it could not get into position to attack. If the submarine was driven under ahead of the formation, the aircraft could by signal divert the convoy and guide it clear of the danger. It could also lead escorting surface vessels to the attack when it could not itself damage the submarine, occupying as it does the most advantageous position for spotting submarines awash or just submerged, and for noting oil slicks, wakes, etc.

93. Dirigibles are especially suitable for convoy work if there is no danger of contact with the hostile aeroplanes, as they can regulate their speed more easily to that of the convoy by stopping, hovering, etc., there is less strain on the personnel, and they can accompany the convoy much further than planes. But for the actual attack on submarines, planes are superior on account of

their rapid maneuvering qualities. Escorting aircraft must always keep their mission in mind—the protecton of the convoy. On no account must they leave their station and be lured away in chase of some real or imaginary enemy at such a distance that he could not possibly harm the convoy. The position of the suspected enemy can be reported and other craft sent to deal with him, but not the units of the escort. There is too much chance of another submarine, perhaps co-operating with the distant decoy, coming in during the absence of the escort and playing havoc with the convoy.

94. Escort is closely allied with mine and submarine search in general, both of which can be ably performed by aircraft if the water is sufficiently clear and the character of the bottom is favorable. The high position of the observer from aircraft gives him a great advantage over one on a surface ship, in penetrating beneath the surface of the sea. Some success was had in locating mine fields and submerged submarines in the Great War, even under the disadvantageous conditions of the North Sea.

Dispatch Carrying

95. The remaining uses of aircraft as listed at the beginning of this paper, are of a minor character. In the present day of rapid and accurate communication, dispatch carrying does not have the importance which it did before the employment of radio. However, there can conceivably arise cases when the rapid transmittal of secret maps and plans which from their nature cannot be sent by radio or telegraph may be of the utmost importance. In such cases the aircraft offers the most convenient mode of transportation. The type of craft used for this purpose is of no importance except as limited by the urgency of the matter, the distance involved, and the conditions to be met en route. The selection of the best type from those available will of course be made. Since the capabilities of different types have been touched upon in considering the uses of aircraft already discussed, there is no necessity for trying to determine here the best machine to use in every possible contingency.

Transportation

96. The above remarks apply in great part to the transportation of personnel and of small vitally needed articles of ma-

terial. It may be necessary to get a commanding general rapidly to the front, or to an urgent conference at a specific time; or to transfer a naval commander-in-chief from one ship of his command to another at considerable distance. It may be necessary to send vitally needed chemicals or important spare parts to ships or organizations at the front. The aircraft again furnishes the most serviceable means.

EVACUATION OF THE WOUNDED

97. The employment of aircraft to transport the seriously wounded has already been tried and planes have been fitted to carry them. But the capacity of planes for this purpose is necessarily so limited that this means of transporting the wounded cannot be expected to cope in any way with the conditions of modern battle. Furthermore it could only be used from localities suitable for landing and not under fire. It could be used to transfer a few men from isolated positions where ordinary means are not available, to base hospitals; provided a sufficient number of planes can land there with reasonable assurance of success. This use is more applicable to times of peace or inactivity, for the transport of individuals from outlying districts to base hospitals for urgent operations, than it is to the conditions of battle. Dirigibles could possibly be fitted as hospital ships, but it is doubtful if the results would warrant the outlay. Military exigencies would not at present countenance the diversion to that use of such important aerial units. When dirigibles become as numerous as ships, we may possibly see such hospital ships of the air.

CONTROL OF OPERATIONS FROM THE AIR

98. As to the control of operations from the air, it is not believed that this has been tried upon any large scale. It is mentioned as a possible suggestion for the future. A birdseye view of a situation, particularly during an approach or an attack on shore, might be of more value to a naval or military commander-in-chief than all the mass of conflicting information sent in by other means. Of course the risks involved in a commander-in-chief leaving his flagship or headquarters must be fully weighed and he must be in direct and instant communication therewith at every moment of his absence. His flight should in general not carry him too far or absent him too long. Control of opera-

tions from the air should be primarily valuable in making dispositions *prior* to the opening of fire, and it would seem that it should terminate before that event; as otherwise there is too much risk of the commander-in-chief being lost or permanently separated from his command. This applies more to conditions at sea than on shore.

99. It might be perfectly practicable for superior officers of land forces, other than the commander-in-chief, such as army or corps commanders, to control operations along their sector of the front from a properly safeguarded dirigible operating some distance behind the lines. Their ability to visit any part of the sector and observe details of troop movements and concentrations far back into the enemy's zone, with their consequent ability to order instant countermoves or to take advantage of obvious weakness, which if reported to headquarters in the usual manner would be so delayed as to lose the opportunity for decisive strokes, should go far to outweigh any attendant risks.

100. At sea conditions are very different. There is no fixed battle front as on land. Kaleidoscopic changes in tactical situations and groupings of forces occur. Hostile forces can make their appearance from any direction. Moreover, sudden changes in weather conditions may reduce or destroy visibility. The flagship does not remain in one place as does headquarters ashore. It would therefore appear extremely unwise, in the present stage of development of aircraft, for a naval commander-in-chief to thus separate himself from his fighting forces during an engagement.

101. In the future, development may so increase the stability, defensibility, and importance of aircraft, that the commander-in-chief can embark with as much safety in a powerful unit of the air force as in one of the sea fleet. In fact air forces may become so increasingly important in future wars as to overshadow the importance of the surface fleet. It is conceivable that the major action of the future may possibly be fought in the air, with the surface craft as the auxiliary force. The director of operations should be with the main force—that is in such case in the air. It will be, from the present outlook, a far cry to such a situation; but this should not prevent due consideration of the advantages of directing operations from a swift and reliable unit of the air force.

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AN ADMINISTRATIVE FLAGSHIP FOR THE UNITED STATES FLEET

By Captain J. K. Taussig, U. S. Navy

While little has appeared in print concerning an administrative flagship for the United States fleet, there has been much oral discussion of the subject. As captain of the only ship which has served in this capacity, the writer has taken an active part in many of these discussions. From them an impression was gained that most officers did not have a full appreciation of the reasons for the adoption of this innovation. There was, therefore, much opposition to the idea within the service. This opposition, added to outside influences, undoubtedly had much to do with the abandonment of the plan before it had been given a fair trial.

Be that as it may, the aforementioned discussions have left the conviction that an administrative flagship is the inevitable outcome of progress in organization, administration, and command; that its addition to the fleet was sound in principle; and that its final abandonment would be a decided step backwards.

It is not surprising that there should be differences of service opinion as to the propriety, necessity, or desirability of having an administrative flagship. Such differences have always been manifest whenever a new departure is undertaken. But in this case, when arguments are advanced against the plan, they are usually expressed in general terms which are not difficult of refutation. The opposition also have reasons which are not expressed, but which show intuitively to be in the minds of those who have difficulty in putting their thoughts into words.

Let us look briefly into some of the reasons for the opposition to the administrative flagship plan.

First, we have the well known conservatism with which a majority of naval officers are imbued. The President of the Naval War College in an address[1] to the last graduating class pointed out how this conservatism was common to naval and military officers as a class, and how, on account of it, advancement along different lines often had been retarded. From those who feel this conservatism in regard to the administrative flagship, the argument is advanced that we have always got along without one, so why make a change? Here the argument ends. They are satisfied to continue to "muddle through."

Then there is our old friend "tradition." In some respects our adherence to tradition has had a salutary effect on the morale and efficiency of the navy. This is because many of our traditions are good. But all traditions are not good, and those that are not, should, of course, be relegated to oblivion. If the world in general had stuck to all its traditions there would have been little advancement. Improvement has come by discriminating between the good and the bad, and casting aside the bad. Here we have the tradition that a naval commander must always be in the front line. It used to be tradition for an army commander always to be in the front line, and always to lead his troops in battle. As armies grew larger, this tradition had to give way to more sensible practice. The commander of an army now takes a position from which he can best handle the situation, and this position is *not* in the front line. It is what is known as "general headquarters," and may be anywhere *not too near* the fighting front. Those who argue against the administrative flagship on account of the front line tradition are imbued with the tactical considerations rather than the strategical and the administrative. The question as to whether or not the commander-in-chief should be in the front battle line during an engagement is not involved in the pros and cons concerning an administrative flagship. The value of such a ship depends on whether or not, in the preparing and training of a fleet for battle, and in the long strategic campaign which must of necessity precede a fleet battle (should there eventually be one), the commander-in-chief is in a better position to develop a more efficient fleet and to carry on a more logical campaign, than if he were always tied down to a slow moving battleship.

[1] "Military Conservatism," by Rear Admiral Sims, published in NAVAL INSTITUTE PROCEEDINGS for March, 1922.

The third reason for opposition is because an administrative ship is not a fighting unit. This can not be a valid reason for denying the employment of such a ship, especially when account is taken of the facts that, in time of war, the auxiliaries far outnumber the actual fighting ships so that the addition of a single non-combatant ship does not become significant; and actual fighting is only the culmination of certain things that go before. Actual fighting may or may not take place. But the things that precede the expected fighting must of necessity occur.

The conduct of these operations has a direct bearing on the ability of the battle fleet to fight a successful engagement. One additional vessel of a non-combatant type justifies itself a thousand times if *in any way* it aids the commander-in-chief in the organization and administration of the fleet, and in the needed communications with the hundreds of widely scattered vessels of his command.

Other expressed reasons for opposition to the administrative flagship are economic and political. The two are usually linked together, as the demand for economy, where it interferes with efficiency, is political in nature. It is generally applied only in such cases where local interests do not suffer thereby. It is argued that especially at this time when an economic wave is sweeping the country there should be no move towards irritating Congress by the addition of a vessel to the fleet, the use for which they, as a body, do not appreciate.

Nothing is gained in the long run by failing to fight for needed naval improvements. And if naval officers do not fight for them, nobody else will. Many good military and naval plans which would undoubtedly have led to increased efficiency and ultimate economy have failed to pull through because of purely political opposition. And when the Congress turns down a department proposition for what they call economic reasons, it is usually because of a false conception of what military or naval economy really is. With them it is not a case of "a stitch in time saves nine." On the other hand it is a viewpoint based on the false assumption that it is economy to save a dollar today even if by reason of doing so ten dollars must be spent tomorrow. The history of naval legislation shows that Congress has not the habit of looking into the future. The Navy Department through its responsible

officers must assume this burden and do what is possible. Therefore if in its wisdom the Navy Department concludes, after a careful estimate of the situation based on the lessons of the World War and a look into the probable future situation, that an administrative flagship is an addition that will increase the efficiency of the fleet, the sooner action is taken the better, and, although it may receive some hard knocks, the sooner will it be a permanent institution.

The foregoing is a brief summary of the reasons heard expressed against the adoption of an administrative flagship. Undoubtedly there are officers who can advance other reasons against the plan. However, no others have been heard in any discussion in which the writer has taken part.

When one examines into the reasons for the adoption of the administrative flagship there are many arguments in its favor.

In order that a fleet can operate successfully in war it must be prepared in times of peace. This peace preparation consists of: (1) The providing of personnel and ships by the Congress; (2) The co-ordination of the fleet so that the various forces will be properly balanced; (3) the training of the fleet so that when the elements are co-ordinated they will act together for the common end; that is, co-operation; (4) the handling of the immense amount of detailed work that is essential to bring about co-ordination and co-operation; that is, administration; (5) the making of war plans.

The Congress has provided ships and the personnel for partially manning these vessels. Whether or not this personnel is adequate is beside the issue here. However, having these ships and a definite number of officers and men, the Navy Department is charged with the organization of the fleet. The Department then, in turn, appoints a commander-in-chief. This officer is responsible for the training and administering of the fleet together with the preparation of certain plans for the employment of the fleet in peace and in war.

It has been customary to have a peace organization and a war organization. This, of course, is fundamentally wrong. It was so demonstrated by the upheaval in the organization of our fleet which took place when we became a belligerent. The peace organization then consisted of an active fleet and a reserve fleet, the latter being a part of the former. The fleet as a whole was

composed of a battleship force, cruiser force, destroyer force, train, etc. The commander-in-chief was always on a battleship.

After the war the fleet was divided. This occurred contrary to the recognized military and naval teaching that concentration is the first great principle of strategy and tactics. Each of the two so-called fleets were divided in the same manner as was the united active fleet prior to the war.

To one who has studied strategy and tactics and who has learned the lessons of the Great War, it is evident that the peacetime subdivisions of our fleet or fleets are not the best. Instead of having all the ships of the same class in a force or group, each subdivision should consist of a combination of ships of different classes in accordance with the duty to be performed. These subdivisions are commonly known as "task groups." For proper organization and training each task group requires its own commander, through whom the commander-in-chief should control.

Such an organization as this has been adopted by the department for use when the Atlantic and Pacific fleets are combined for joint operations, a combination which undoubtedly will become permanent as soon as the political situation admits. This organization is published in Table II of the *Navy Directory* of January 1, 1922. It is based on a logical distribution of the vessels of the fleet in accordance with tasks that would be imposed in case of war. The main task groups are classed as forces as follows:

(1) Administrative flagship (*Columbia*).
Tactical flagship *(Maryland)*; also a unit of the battle force.

(2) The BATTLE FORCE, composed of:
One battle squadron.
Six destroyer squadrons.
Air squadron.
Submarine squadron.

(3) The BASE FORCE, composed of:
Old battleships.
Old cruisers.
Mine squadron.
Train.

(4) The SCOUTING FORCE, composed of:
One battleship division.
Nine destroyer squadrons.
Air squadron.
Submarine squadron.

(5) The CONTROL FORCE, composed of:
Old battleships.
Old cruisers.
Mine squadron.
Destroyer squadron.

In this organization the fleet is always ready for immediate expansion and operation in case of war. The commander-in-chief is on a separate vessel called the administrative flagship, which, at this time, happened to be the *Columbia,* formerly the *Great Northern.*

Why, in this carefully thought-out organization of the United States fleet, should the commander-in-chief be on a vessel independent of all the forces?

The commander-in-chief of a large fleet, the units of which a great part of the time will be widely scattered geographically, must, for administrative purposes, be free to go wherever and whenever he pleases. He should not be tied down to the battle force, scout force, or control force, any more than the commander-in-chief of an army should be permanently attached to the infantry, cavalry, artillery, or any other subdivision. When we look at it in a broad sense it seems strange that, with the development of our fleet, we have so far lagged behind in organization and administration as to insist on the commander-in-chief not only being tied down to a battleship, but also often in immediate command of the battleships composing the force.

This practice has not been to the advantage of the navy. It has had much to do with the lack of balance in our fleet today. The necessity for and the importance of the fighting auxiliaries, especially the cruisers, have not usually been appreciated by the officer in chief command afloat owing to his intimate connection with the battleships. The submarine alone is responsible for the increase in destroyers, which vessels were numerically inadequate until the war forced them otherwise. Our commanders-in-chief

have been so much more intimately connected with the battleships, it is natural that their efforts for efficiency have been devoted mostly to this class of vessel. Until recently there has not been sufficient concentration of effort to obtain the necessary cruisers and other fighting auxiliaries that a balanced fleet requires. Consequently the limitation of armament agreement finds us without any battle cruisers, very few light cruisers, and no destroyer leaders. We are forever precluded from having any battle cruisers. It will be many a day before Congress will be in a mood to provide light cruisers and destroyer leaders.

It is held that this would not have been the case had our commanders-in-chief not always been battleship men, tied to battleships and nothing else.

Being attached to one of the subdivisions of a fleet, be it battleships, cruisers, or any other class of ships, is not conducive to the proper administration of the fleet as a whole; does not permit the commander-in-chief wide enough latitude in conducting a strategic campaign; may be of considerable embarrassment to him in a fleet action; and, owing to the perversity of human nature, narrows his viewpoint.

It is believed that if prior to and during the battle of Jutland, the British commander-in-chief had not been physically attached to the battleships, but could have been on a separate ship—fast enough to take station where he pleased, and with plenty of room for the staff necessary to control so many units—the British forces would have been better co-ordinated, and consequently their co-operation much more effective when the long looked for day arrived.

When this country became a belligerent in the Great War the commander-in-chief of the United States Fleet was so closely identified with the battleships—he and his staff being housed on one—that, in so far as actual command was concerned he never did control the forces operating in the vicinity of the enemy. Excepting for an inspection trip, which was not made on a man-of-war, he remained physically associated with the large portion of battleships which kept far from the scene of conflict. On account of this we had the painful experience of witnessing our commander-in-chief with his highly trained staff unable to perform the functions for which intended. Instead, the actual war

operations were placed in the hands of a subordinate, who, not being physically attached to a battleship, was free to go abroad. Here, owing to a lack of foresightedness in our organization, he had to recruit, organize, and train a staff after the beginning of war, and while actually conducting operations against the enemy.

There are a number of disadvantages in having the commander-in-chief on a battleship or any other purely fighting ship. In the first place the living spaces on a battleship are crowded, even when there is no flag officer. When such a vessel becomes the flagship of the commander-in-chief the conditions become very unsatisfactory owing to the size of his staff. And the commander-in-chief of the United States fleet should, in order properly to administer, command, and plan, have a staff of not less than twenty officers. No fighting ship can accommodate this personnel without undue crowding. Fighting ships are not built that way.

The battleships in order to be effective should train and operate together. Their efficiency as a fighting force depends on their concentration and effective co-operation. Some parts of the fleet may be, and the bases will be, in widely scattered localities. The battleship is expensive to operate. Its separation from other battleships weakens the fleet as a whole. It is illogical to place the commander-in-chief on a vessel that is the most costly to move from place to place; that interferes with proper training of personnel; and which, by detachment, diminishes the fighting strength of the fleet.

The commander-in-chief should be so situated that he will not be forced through economic or other reasons to refrain from visiting any part of his fleet and to go to any base in order that he can inspect and make effective plans for the future. We in the navy must keep pace with developments that, for efficiency and future safety, demand the breaking away from traditions which progress has shown to be faulty. We, like the army, must, for the proper handling of a large force, establish a general headquarters which can be moved to the best situation at the discretion of the commander-in-chief. In order to do this the general headquarters must be entirely independent of the subdivisions that compose the fleet as a whole. The fleet general headquarters must be a ship. It is what, for want of a better name, the Department calls an administrative flagship.

Officers have been heard to say that the commander-in-chief has too large a staff. This is because the functions of such a staff are not understood. Many do not see beyond the tactical relation between the commander-in-chief and his fleet. They fail to appreciate that tactical distributions and movements are only the culminations of organization, training, strategy, logistics, planning, and administration. They overlook the importance of communications. A staff of twenty officers to assist the commander-in-chief of a force as large as our United States Fleet, is not too large.

The separate flagship for the commander-in-chief is desirable for the development and training of the officer personnel. This is one of the most important functions of the fleet in peace times. It is not given the careful consideration that is its due. We spend hundreds of thousands of dollars in the training of individual ships for target practice. Even when there is no cloud on the horizon we go on and on with the training of the enlisted personnel, nearly all of whom are transients, and the most of whom will not be in active service should a war come. This training of the enlisted personnel is necessary, and is as it should be. But when we consider the large sums spent for this purpose in contrast to the very small sum allowed for the training of the officer personnel, it does seem that a more useful distribution of funds might be made. Only this year the concentration of the fleet with the accompanying maneuvers had to be abandoned for the lack of funds. This maneuver period was to have been one of real training for the officer personnel. Such joint-maneuvers are more important than target practice by individual ships. This is because the officers are the only really permanent part of the navy. They come and they stay. If there is a war within a generation the larger part of them will be in active service. Therefore their training is most important. The efficiency of the transient enlisted personnel depends primarily on the efficiency of the permanent officer personnel.

While this may seem to be a digression from the subject at hand, it is in fact intimately connected with the administrative flagship. Two of the functions connected with the training of the officer personnel are the tactical game board and the chart maneuver. These tactical games and chart maneuvers to be

properly conducted require space and facilities beyond the capacity of a battleship, or any other purely fighting ship. They require from one to two weeks for each game or maneuver. Therefore, if attempted on a battleship they greatly interfere with the routine and training of the crew. In a properly appointed administrative flagship all these difficulties are overcome. The commander-in-chief has at his disposal the personnel, the space, the time, and the facilities for the studying and making of plans, and for trying them out on the game board and in chart maneuvers. This is an asset for the commander-in-chief, which, if the administrative flagship had no other attributes, fully justifies the Department in its adoption.

And last but not least is the question of communications. We are learning to appreciate the importance of this, especially with regard to the uses of radio telegraphy. The possibilities in this direction are so great, and the advantages to a fleet which has grasped the opportunities are so vital, no means should be lost in making them effective. In order properly to do this, there are required many instruments, much space, considerable personnel, and extensive aerials. There is not room on a battleship for any of these unless our communications are limited to the peculiarities of such a ship. And such limitation would be inexcusable. A ship on which there is ample room for the instruments and personnel without interfering with its legitimate work; a ship on which aerials are capable of permitting the simultaneous working on from twelve to twenty wave lengths without interfering with the arcs of train of the guns; a ship in which the commander-in-chief could, during an extensive strategic campaign, take a central position and efficiently communicate at one and the same time with all of his forces; such a ship in case of war would be worth its weight in gold. And such a ship is also invaluable in peace times on account of the part it can take in the development of fleet communications.

To summarize: A logical organization of the United States Fleet requires for the commander-in-chief a ship independent of any and all subdivisions of the fleet. This is necessary in order that:

1. He and his staff can be properly housed without interfering with the fighting efficiency of any ship.

2. He can take a broad view of the entire situation instead of having his horizon partly limited by his physical attachment to any one subdivision.

3. He can go when and where he pleases without interfering with the training of any unit of the fleet, or weakening its fighting strength. Such freedom of movement is necessary in order that he can inspect any part of the fleet, and visit any of the fleet bases with the view to obtaining of first hand information to assist in making plans.

4. He can have adequate facilities for planning, with sufficient space for carrying on tactical games and strategical chart maneuvers.

5. He can develop and carry on communications in keeping with the demands of administration, and to insure efficient co-ordination and co-operation within the fleet, and from fleet to shore.

Such a ship must have certain characteristics, some of which are:

1. It must be of sufficient size to:

(a) Have adequate quarters for the admiral and his staff—administrative, tactical, and personal.

(b) Have space for administrative offices, operation office, intelligence office, game board room, conference room, record room, etc.

(c) Have sufficient space for radio rooms and aerials; chart room and plotting room.

2. It must be seaworthy and steady.

3. It must have a sustained speed greater than that of the battle force.

4. It must have a large steaming radius.

It is manifest that no battleship nor any other fighting ship possesses the above characteristics. Nor does any merchant ship possess all of them. In order to obtain a perfect general headquarters ship it will be necessary to build one. There is no danger of that happening in the near future. Such a ship would be worth more to the navy and the nation than any single unit which the limitation of armament agreement permits us to build. However, the day is coming when, if we do not take the

lead in this matter, we will have to follow in the footsteps of some other navy, a condition which has frequently happened with new advanced ideas originating in our own service.

The Navy Department in order to make the combined fleet organization effective, appreciated the necessity for an administrative flagship. It was realized that no fighting ship was suitable, and to convert a fighting ship would cost more than was at the Department's disposal. In the search for a suitable vessel the *Great Northern* was selected. The President signed an executive order which transferred that ship from the army to the navy.

There is no question but that the *Great Northern* came nearer to the ideal for an administrative flagship than any other vessel under the American flag. At a comparative small cost she was converted for this purpose and renamed the *Columbia*.

The *Columbia* is not a "huge" vessel as has often been represented in the press. In fact, as merchant ships go, she is of quite moderate size.

Her chief characteristics are: length, 525 feet; beam, 63 feet; mean draft as flagship, 25 feet; displacement at this draft, about 12,500 tons.

She has triple screw Parsons' turbines capable of maintaining a sustained speed of from 21 to 23 knots according to draft.

Her fuel capacity is 3,000 tons of oil which gives a steaming radius of over 9,000 miles at 15 knots. She is very economical in port, using less than six tons a day. It would have been an easy matter to increase the fuel capacity by the conversion of one or more hold spaces into tanks. This probably would have been done as soon as money became available.

The battery had not been installed on account of lack of funds. It was to consist of four 6″ 53-caliber guns and four 3″ anti-aircraft guns. A saluting battery of four three-pounders was located forward on the boat deck.

The boat equipment consisted of:

1 50-foot motor barge for the commander-in-chief.
1 40-foot motor barge for the chief of staff.
2 35-foot motor boats for staff use.
2 35-foot motor boats for ship use.
2 40-foot motor sailers.
2 36-foot motor sailers.
2 28-foot whale boats.

The radio equipment was as powerful as any afloat. In so far as known, it was more complete, with facilities for listening in on more tunes, than any previously installed on any vessel in the world. While all aerials had not been completed, a glance at the photograph (frontispiece) will show their extent, and the insulations inserted throughout the standing rigging.

By further reference to the photograph it will be seen that there is a main deck extending the full length of the ship. This is known as "A" deck. Above it is the boat deck, and below it, with air-ports, the "B" and "C" decks. Although the next lower deck, designated as "D", is above the water line, the air-ports with which it was fitted throughout its length were sealed up during the war and had not been reopened.

On the boat deck were carried the two 36-foot motor sailers and four 35-foot motor boats. They were hoisted in on davits. The two barges and two larger motor sailers were carried aft on "A" deck. They were hoisted in by a large boom which is shown in its topped-up position in the photograph.

Over the bridge and chart house was the plotting room with signal platform on top. Under the bridge and chart house were the captain's quarters. The galley for the admiral's, captain's and staff messes was in the deck house abaft the after smoke stack.

Opening on to the enclosed part of the promenade on "A" deck was the large conference room adjoining the admiral's quarters, which consisted of living room, stateroom and bath, and spare stateroom and bath. Abaft this was the chief-of-staff's cabin with staterooms and baths for the chief-of-staff and assistant chief-of-staff, and one spare stateroom and bath.

Opening on to the open part of the promenade were staff officers' staterooms, and, in the after-most part, the large game board room with a 30-foot skylight. This room was also used as the staff officers' mess room.

On the "B" deck (upper row of air-ports) was the auxiliary radio room forward of the mast. On the starboard side were the wardroom officers' staterooms, wardroom, junior officers' mess room, junior officers' staterooms, and all the ship's offices. On the port side were staff officers' staterooms, and the staff offices comprising intelligence office, operation room, fleet pay-

master's office, administrative staff officers' office, communication office, flag secretary's office, record and file room. Abaft the mainmast in a large space was the main radio room, and abaft this, the sick bay.

The warrant officers' mess room and staterooms, the large laundry, and printing rooms, were on "C" deck (lower row of air-ports). Practically the entire remainder of this deck was crew space—large airy compartments on both sides extending half the length of the ship. An important feature and one of real value was that the ports of "C" deck are sufficiently high above the water line to permit of their being kept open at sea at all times excepting during bad weather.

It is unfortunate that, after spending considerable time and money fitting up the best ship to be had for the use of an administrative flagship, commercial and political interests forced the navy to give it up. This the more so as there is not another merchant ship flying the United States flag that has the combination of size, habitability and sea-worthiness, together with the necessary speed, to warrant its conversion for this purpose.

A battleship has been shown to be unsuited for many reasons. The new scout cruisers are impracticable of conversion. In the first place they are much needed for the duty for which they are built. In the second place they have not sufficient berthing and living spaces for their regularly allotted complement of officers and men. It would seem that in the absence of a better ship, the conversion of one of the old armored cruisers is the most feasible alternative. And if it is feasible, it should be done. These cruisers are of sufficient size and have fair speed. By the removal of some of the unnecessary battery, and by making not very extensive alterations in the living and other compartments, one of these vessels would be of sufficient value to the organization to warrant its assignment to this special duty. Then, when it proves its value, as it undoubtedly will if given the opportunity, further alterations such as converting from coal to oil burning, can be made as soon as funds are available.

It is to be hoped that the Department will see its way clear to provide another administrative flagship in order that the excellent organization developed for the combined United States Fleet will be thoroughly effective.

Brains do not belong in the body; they belong in the head. Therefore let us provide a head, in the form of an administrative flagship, to carry the brains which are to control the United States Fleet.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

REAR ADMIRAL PEARY, U. S. N., SCIENTIST AND ARCTIC EXPLORER

By Lieutenant Commander Fitzhugh Green, U. S. Navy

Lieutenant Commander Fitzhugh Green is well qualified to write a sketch of Admiral Peary's life. Lieutenant Commander Green has always been a hunting and camping enthusiast. Study of arctic literature and a close friendship with Admiral Peary eventually led him to join the Crocker Land Expedition. He spent over three years with the Smith Sound Eskimos in North Greenland and Ellsemere Land. In 1914, Green and Macmillan established a new record to the Northwest on the Polar Sea. The author of this article has enjoyed the friendship of Amundsen, Shackleton, Stefansson, Evans, Rasmussen, and others in our generation who have with untiring zeal helped blaze the long white trail to the Ends of the Earth.

Editor.

Robert E. Peary was born in Cresson, Pa., May 6, 1856. He passed his boyhood in Maine and graduated from Bowdoin College in 1877. He entered the Coast and Geodetic Survey from which he joined the navy as a civil engineer in 1881. By 1885, though only a lieutenant, he was engineer-in-chief of the Nicaraguan survey. He invented a new type of lock-gates for the proposed canal and otherwise distinguished himself from the common run of youthful pioneers.

His Danish friend Maigaard literally broke the ice for the second period of Peary's life. He persuaded the young officer to accompany him to Disco Bay, Greenland, for an ice-cap reconnaissance in 1886. Instantly and deeply was Peary bitten by the exploring bug. And nothing could have demonstrated his personality and temperament better than that he threw all precedent and centuries of experience to the winds: he determined to strike out on a new unbeaten path to the Pole.

Since Hakluyt's day men had tried to penetrate the Polar regions by water routes. There were three main gateways:

1. North around Scandinavia past Spitzbergen.

2. Through Baffin Bay up the Greenland coast.
3. By Alaska into Behring Sea.

Early Europeans used the first route because it enabled them to cling to their continent. As the second, by Greenland, meant crossing the North Atlantic it did not become popular until in the last generation when both British and American expeditions raced it neck and neck. The third one, of which the take-off is Point Barrow, Alaska, never has been conquered even to a mild degree. Such tragedies as DeLong's voyage in the *Jeannette*, our own naval enterprise, serve only to emphasize the desperate nature of tackling an untried arctic route.

But this is what Peary did. Nor was it simply a case of laying his ship on a different course, or threading his way through another sound or channel as other courageous explorers have. His plan was infinitely more daring. He chose the Greenland ice-cap.

Greenland is a great pear-shaped continent nearly 1,500 miles long, and something like 900 miles broad across its upper bulge. It is the classic example of the glacial age. Except for its rocky fringes and the southern tip, it is buried in ice. Depth of this frosting is conjectural. Along the coast 2,000-foot cliffs are literally dwarfed by the ice dome rearing back of them more than 9,000 feet into the sky.

To seek the Pole by the Greenland ice-cap could be compared to hunting a wild elephant by crawling up its back until close enough to shoot it behind the ear. A wild elephant's back is a tame comparison to that blizzard-tortured desolation Peary chose as his way north.

For practically ten years he fought a losing battle. True, he learned the technique of arctic travel from the natives; how to drive dogs; how to build snow igloos; how to exist on blubber and raw meat; how to wear skin clothes; how to hunt without firearms; how to sleep sitting up without a sleeping bag; how to burrow into a drift when taken unaware by a howling blizzard. He brought back three ponderous meteorites, one of them weighing ninety tons, the largest known to man. He collected a large quantity of information of scientific value as well as of popular interest. But so far as his ambition to reach the Pole was concerned he had failed.

Not until 1898 did he abandon the ice-cap. Old-timers said, "I told you so," when he admitted the Pole could not be reached that way. Also, they pointed out the foolish enthusiasm of youth and inexperience. Indeed, the injustice of the criticism Peary suffered at this critical stage of his life would have broken a weaker character.

He was forty now. He had battered away at a problem the geographical world declared could not be solved by the means he chose. That he had determined the insularity of Greenland was largely ignored. That he had made several ice-cap trips of over 1,300 miles, driving his own sledges and with no help save that of his tenderfoot companions, was not advertised. Yet Nansen, his contemporary, had secured a place of exalted fame from one summer's crossing of the narrow southern tip of Greenland. Nansen had food and Lapps and no back trail to figure on. Peary did five times the distance on little more than raw walrus meat and blubber. Eskimos helped him up the first glacier, then deserted him in terror at the prospect of travelling the great unknown interior.

The second period of Peary's northern work began in 1898 when he based on the opposite side of Smith Sound. By this time he had won the confidence of the natives. He realized the value of their dogs and meat. Greely, Kane, Hayes, and all the British expeditions up this coast had deprecated the Eskimo's value as an adjunct to arctic work. Peary cleverly recognized that no white man can pretend to lead his natural life in high latitudes. He trained himself and his men to be Eskimos. He went into their igloos and became one of them. He learned to eat their food, to wear their skin clothes, to perform the innumerable little tricks of keeping warm and dry that may mean the difference between life and death when caught in a sudden crushing snow-filled gale. When he crossed the Ellsemere Land he took enough families with him to provide hunters, seamstresses, and dog drivers.

It must be recalled that the upper left-hand (western) corner of Greenland converges with the land opposite. Arctic currents drag a jam of ice through this narrow passage. Open water is almost unknown. For this reason expeditions have usually disembarked in the Smith Sound region about 78° north

latitude, and made the rest of their way by sledge. Greely, Kane, Nares, and one or two others have happened to find open years which permitted them to base further north than Peary's earlier attempts. But their terrible loss of life and suffering offset any advantage they gained in the beginning.

Now began a new kind of work for Peary. On the ice-cap, despite its frightful wind and cold, smooth going was the rule. Coastal sledging means one unending struggle over the mountainous ice-jams that are formed by tide and current. On the ice-cap Peary had simply to grit his teeth and plug away. So long as he didn't starve or freeze, and held his course, all he had to do was to keep on lifting one foot after the other in order to reach his destination. Along the Ellsemere coast ten minutes of travelling on the level was a luxury that was stimulating. The average day consisted of a kind of exaggerated football game. Five hundred pound sledge load was the ball. Each driver carried, drove, pushed, and pulled his own. The opposing line was a serrated ridge of huge sharp ice fragments from ten to fifty feet high. And when by sheer strength and ice-axe this line was passed, there was always another just beyond. The enemy's tactics varied by cunningly placed lanes of open water, the most dangerous trap in the north.

It was a hard school, and Peary was a pupil for another ten years. It is interesting that this corresponds to the time he spent settling ice-cap delusion. But he was learning every day of it. His troubles came so fast that his publisher never gave him room to list them. On the Greenland coast he had only crushed his ankle on shipboard, lost a year's cache of stores on the ice-cap, and the like. On the Ellsemere coast he froze off every toe except a fraction of each large one. At Cape Sabine his Eskimos died like flies from a kind of dysentery. Only a few years ago the writer found the bodies of two of them wedged down between the boulders. Clothing had not even been removed from the mummified remains. Peary's white companions even pronounced him insane for the seemingly super-human campaigns he planned.

One misfortune after another assailed him at home. He was told that he would receive no more leave from the Navy Department. What this meant can be appreciated only in the light of

the ten years' struggle he had already endured for the sake of his ambition. His finances, never plentiful, ceased to exist. Only by dint of lecturing and writing to a degree nearly as exhausting as his travels over northern trails was he able to accumulate the pitifully scanty store of supplies and equipment he carried on these earlier expeditions.

These were the blackest years of his life. Earlier he had been able to exploit the novelty of his schemes as a means to further successive expeditions. The meteorites, the crossings of Greenland, and the like were stepping-stones to that notoriety so profitable to the lecturer and writer. Now the novelty had worn off. In despair he wrote to a friend:

"I seem to have reached the end of the lane. What I gained in Greenland I am losing in Ellsemere Land. Soon they will call me a fake, say I am just hoarding what I can mint from the public's credulity. Yet, would it profit me to confess that all my savings, all of my wife's savings, all I can beg, borrow, or steal, have gone into the quite inadequate equipment I have gathered for the next attempt?"

Such indomitableness is worthy of the best traditions of the navy.

It is difficult to realize the abysmal discouragements that sprang up on every hand. Members of earlier expeditions, broken by the inhuman toil of arctic sledging and embittered by the petty quarrels isolation breeds, lost no opportunity to backbite and discredit the man who they jealously realized was a better man than they. He dared to go again. Eskimos behaved with childish petulance when he returned without the promised gifts his anemic capital sometimes couldn't buy. And constant worry prevented his training like an athlete for the physical strain of his long exhausting trips. Instead, his naturally rugged constitution was sapped of its reserve endurance. Inanition was the logical result; and on practically all his later sledging Peary was a victim of what northern travellers call "starvation bloat." Formerly this distemper was erroneously thought to be scurvy. It is painful swelling of limbs consequent upon overwork and under feeding. Peary himself has described his sensations when suffering from it as the combination of "elephantiasis and toothache"! No more agonizing climax to his troubles could be conceived.

A flood of friendship turned the tide. Peary's magnificent tenacity had finally won him the attention and interest of a group of influential New Yorkers. When the Navy Department flatly refused to even consider further leave to prosecute more northern work, Mr. Charles Moore personally convinced President McKinley that the public would hold our government gravely culpable for cramping the energies of the one man who might redeem American geographical prestige so marred by recent arctic fiascoes. When burden of debt was about to place both Peary and his wife in legal toils Mr. Morris K. Jesup and a score of others reached down into their own pockets and produced. When the ordinary run of vessels fit for ice work still fell short of the strength required to face the polar pack, the *Roosevelt* was built. Peary's own designs were used.

The third period of Peary's life was now on. In the first he had made his ice-cap struggle. In the second he had crawled up and down the Ellsemere coast. He now launched his startling scheme to force a ship to the very shores of the Polar Sea. By basing there and with the help of dogs and Eskimos he might well hope to make the 500-mile dash to the pole and get back before spring leads cut him off. Only his intimate knowledge of ice and current conditions north of Cape Sabine made this plan in the least way possible. It was a long known fact that the very passage Peary selected was the most ice-choked hole north of the arctic circle. He had observed year after year that under certain combinations of wind and tide acting over limited combinations of shoal and deep, the ice jam suffered itself to be ripped and split until slender black leads of open water strung here and there between the Polar Sea and Smith Sound. Peary determined to gamble on the position of these leads. If the ship were caught she might suffer the fate of the *Proteus* which sank in eighteen minutes after being nipped. If he succeeded in getting through, safe return was even less likely.

He got through and he got back. He began to break records. In 1902 he made a new American record with 84° 17′ north. In 1906 the world's record was smashed when he reached 87° 06′ north. On April 6, 1909, he reached the Pole.

This was a many-sided triumph. Obstacles at home had been overcome. Ice navigation had been set a new standard by the

Roosevelt's performance. But beyond a shadow of a doubt the greatest factor in Peary's success was the remarkable sledging technique he had developed in twenty-five years of practice.

He worked on the unit basis. Logistics of his units were as perfect as mathematical reason could make them. A unit comprised one man, one sledge, and one team of dogs. This unit was independent and self-supporting for fifty days. The sledge carried about 650 pounds to start with. Of this 500 pounds of dog pemmican gave each animal one pound per day. Fifty pounds of hard biscuit and fifty pounds of man pemmican gave the driver a pound of each a day. A few gallons of kerosene, a tiny stove, tinned milk, tea, and some extra footgear and mittens completed the outfit.

A snow igloo will hold four men comfortably. A gallon of tea at night and another in the morning will keep four men going. Four men can just about handle one 600-pound mass over a seventy-foot ice pressure-ridge. One white man can keep three Eskimos busy, amused, fed, cheered, and loyal. Thus four men, one white and three brown, was the size of party Peary chose to group his helpers in.

Dogs and men have one characteristic in common, both easily and gladly follow where another has gone. This quality is an instinctive physical and mental laziness. For men or dogs to break their own trail is toil. It means concentration every moment to avoid pitfalls and rough spots. It means picking footholds. It means a kind of subconscious grief and jealousy over the ease with which those behind must come.

So members of each party of four took their turns at trail breaking. And when the whole party had been exhausted by a week or so of battering down ice walls, cutting ice roads, and plowing heavy snow, it stood aside and let the next party, fresh and eager, take the van.

This plan made it possible to line the trail with food. The advance patrol wore out physically before it had used all its supplies. It cached what it had, turned, and sped back light, leaving its extras for those to come. In this way physical energy of men and dogs was conserved. Land advance in the recent war was made by the same system of trail breaking and replacements that was used on the Polar Sea.

It is not difficult then to understand how Peary placed himself with fresh dogs, picked men, and adequate supplies within easy striking distance of the Pole. Conversely, it is not conceivable that a single unsupported sledge party could make the entire trip out and back as Cook claimed to have done. Peary's strongest trail breaking party collapsed at one quarter of the distance to be covered. Six groups were thus expended in blazing the way.

Peary has been scored for the unseagoing nature of his work. This and lack of affiliation with naval men necessitated by his long absences no doubt account for present professional disregard of his achievements. Even the Navy Department indicated grave doubt as to the ultimate value of his oceanic and other scientific investigations. And there existed an undeniable feeling that every year he spent north took him that much further away from nautical skill of any sort or degree.

No view could be more unjust. Few naval officers have had to face afloat the gauntlet of perils and difficulties Peary ran on every voyage north. His personnel consisted of scientific assistants wholly unversed in sea matters, and a motley crew of 'down-east' fishermen. Better classes of deck-hands and engine-room force would not sail away for an indefinite period on the meager wages Peary was forced to pay.

He had but one real aid, Bob Bartlett, who acted as a kind of executive officer so far as the ship was concerned. The two of them took the *Roosevelt* through thousands of miles of uncharted, unlighted, ice-filled seas. When the rudder was bitten off in an ice-jam they beached her and rigged a new one. When fuel ran out they dragged into a Labrador fiord and cut driftwood.

To illustrate his seamanship and his engineering ability, take one meteorite he brought back which weighed over ninety tons. The mass was well back in the hills. There was no dock to handle it from shore to ship. Time was painfully limited by constant snow storms, gales, and ice. Yet Peary wrestled the huge lump down, got it aboard his little vessel, and turned it over to the 100-ton crane in the New York navy yard without a hint that he was doing more than his normal duty. Compare this absurd equipment with that used at the gun factory in handling a six-

teen-inch gun or a weight similar to that of the meteorite, and some idea of the feat may be formed.

One remarkable aspect of Peary was his extraordinary veracity. A queer implication, no doubt. But in going back over records of other explorers it is almost impossible to find one that did not consciously or unconsciously exaggerate. It is so easy to create a false impression among those at home who are not familiar with arctic work. It is so safe and simple to fill in one's tale with details that make it vivid and alluring, yet which are no more true than the narrative of a novelist who knows his atmosphere and manufactures his episodes to fit. Peary never succumbed to this temptation. When he had gone his sledging limit he took the best sight he could, made the best notes his weary brain would permit, built the highest cairn his exhausted muscles could manage, and came home. This statement has been proved literally thousands of times. To the popular mind it means little; the popular mind loves to be duped. By the naval officer's standard there is no middle ground between truth and untruth. But to the world of science there is a middle ground, and it is by far the widest area of all research and information. Peary was the single explorer in the history of the north who entirely avoided it.

This same sense of truth and justice may have accounted for his ability to handle the varied elements of his subordinates. Eskimos are childlike. They are brave, devoted, trustworthy, and honest one moment; the next they may be just the opposite. Superstition can turn their courage to terror in an instant. Pique alone is sufficient to bring about desertion. Honor among most primitive races is a matter of convenience. To keep the services of such people through all the years he did, was a monument to Peary's tact and diplomacy.

Then there were his scientific assistants. The north can poison a white man's mind. Arctic neurasthenia is a common malady among Danish in South Greenland. Few expeditions have escaped insanity in some form or other. When the leader portions out skins and food and fuel he may be measuring the life span of his men. Fuel and food can be allotted with geometrical nicety. Skins and Eskimo assistants, routes, weather, and the like cannot. The white driver fights a blizzard, freezes, starves, thirsts, and sometimes dies, all the while cursing his leader for the

fractional partiality he seemed to have shown in assigning garments or the course of this particular trip. Peary's command used to return hating him in a way that murder couldn't gratify. Every arctic leader has had the same experience. When the antidote of normal life neutralizes the poison, this bitterness is gradually dissolved. But by that time all are separated and again engaged at home in their individual pursuits. While north, when friendly spirit is the one human bond, only the strongest character can rise above the terrible mental depression and irritableness which isolation and physical suffering bring. Peary could; he had the incentive. But those with him year after year could not. Only by magnificent patience and forbearance was he able to hold his authority over them with sufficient strength to utilize their aid to the end.

As navy men we cannot but admire such supreme qualities of command. To be sure aboard ship we have our uniforms and constant touch with Washington, routine, drill, and discipline to remind us of the authority vested in our superior officer. But even with all this there must be something more. There must originate in our leaders a spirit of professional cohesion which will permeate the entire ship's company and imbue them with a unity of purpose and ideal. This spirit must be strong enough to rise above discomfort, monotony of task, and every form of temperamental incompatibility. It is the priceless virtue which every officer spends his life in learning to master and to use. Yet, alas, how few are truly successful.

Arctic work magnifies the leader's difficulties a thousand times. Peary, for instance, had two masters and three groups of subordinates. He was answerable to the Navy Department and to his scientific backers; he had to direct and use successfully, first, a tribe of Eskimos; second, an always unruly crew; third, his special aids who were almost 100 per cent tenderfeet on every trip he took. His methods under the circumstances warrant the study of every one of us. His success deserves our most genuine pride. And the heroic tenacity of purpose that finally won him the goal of his life's endeavor, that took his life in the end, must be justly added where it belongs—to our capital of traditional service valor.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A BRIEF HISTORY OF THE INTERVENTION IN HAITI

COMMANDER R. B. COFFEY, U. S. NAVY

PRELIMINARY OCCURRENCES AT CAPE HAITIEN

In the spring of 1915 a revolution, led by General Rosalvo Bobo, began in Haiti against the government of President Vilbrun Guillaume Sam. As characteristic of all revolutions in this country the fighting began in the north. Until July the revolutionists had not got beyond Cape Haitien in their advance on the capital at Port au Prince.

On June 19 the French cruiser *Des Cartes* landed a force of fifty men at Cape Haitien for the protection of foreign interests. On July 1 the commander cruiser squadron, Rear Admiral W. B. Caperton, U. S. N., who initiated and carried through the operations incident to the intervention, arrived at Cape Haitien with the U. S. S. *Washington,* under orders from the Navy Department to thank the French commander for his action and to take necessary steps to protect property and preserve order. The U. S. S. *Eagle* was assigned to his command and arrived at Cape Haitien on July 4.

At this time the government forces occupied Cape Haitien and the territory to the southward and westward. The revolutionary forces were close to the town approaching from the eastward of the Haut du Cap River (Sketch 3). In order to insure the protection of property and preservation of order, Rear Admiral Caperton informed the commanding officers of the contending forces that fighting in Cape Haitien would not be permitted and that he was prepared to land U. S. Naval Forces to lend effect to this decision. On July 9, when the fighting drew near the town, a detachment of one officer and twenty-nine marines from the *Washington* occupied a position on the Cape Haitien–Petite Anse

Road—the only road at that time open to the advance of the revolutionists, and the *Washington* and *Eagle* prepared to support quickly this detachment by further troops and gunfire. This landing was necessary to prevent a sudden rush of combatants into Cape Haitien. The position occupied by the marines was a strong defensive one across a peninsula, barely fifty yards wide, and well within supporting distance of both ships (Position A, Sketch 1). One flank rested on the Haut du Cap River and the other on the sea. This was the first landing of troops in Haiti. From then until July 27 order prevailed in Cape Haitien, while the fighting continued at intervals in the outlying country, and at times came within a mile of the town.

THE OCCUPATION OF PORT AU PRINCE

On July 27 information reached Cape Haitien that a revolutionary outbreak was occurring in Port au Prince; that the Guillaume government had been overthrown; that many political prisoners had been murdered in their cells; and that the President with other government officials had taken refuge in the French and Dominican legations. This information was confirmed in the course of the day by cable from the American Chargé d'Affaires at Port au Prince, who further stated that a forcible entry into the French legation was threatened to remove the President; that many had been killed in the course of the fighting; and that some foreign legations had cabled for men-of-war. The force on shore in Cape Haitien was immediately withdrawn and, at 8 P. M. July 27, Rear Admiral Caperton sailed for Port au Prince with the *Washington*, leaving the *Eagle*—Lieutenant Aubrey K. Shoup, U. S. N.—in charge of the situation at Cape Haitien.

The *Washington* arrived at Port au Prince at 11:50 A. M., July 28. Two staff officers were immediately sent ashore to investigate and report conditions. These officers found the situation practically as previously reported, but that an hour before the *Washington* arrived a mob of about sixty Haitians had forcibly entered the French legation and had removed and killed President Guillaume. Parts of his body were at this time observed being paraded about the streets. There was no government or authority in the city and chances of increasing disorder were great. The French legation was visited by these officers and the French

minister, the British Chargé d'Affaires, and the American Chargé d'Affaires were invited to go on board the *Washington* and confer with the Admiral.

It was realized at once that the interposition of American naval forces in the affairs of Haiti was necessary; and that, to prevent European complications which were most probable in view of the violation of the French legation, prompt action was required. The city was in anarchy, the excitement and riot were growing, and the danger to foreigners was increasing every moment. At 4 P.M. it was decided to land immediately and take charge of the city.

The landing force was placed under the command of Captain George Van Orden, U. S. M. C., and consisted of the *Washington's* marine detachment, the twelfth expeditionary company of marines, and three companies of seamen from the *Washington*—total about 340 officers and men. The only places where landings can be made at Port au Prince are directly in front of the city on the wharf (Position A, Sketch 2) and on the beach at Bizoton, about two miles to the westward of the city limits (Position B, Sketch 2). As nothing at all was known as to the nature and degree of resistance that would be encountered, as the city would be entered about dark with unseasoned troops, in view also of the topographical lay of the town, in which the native part lies with its long axis north and south, which would leave in the air both flanks of a force entering at the front of the town, and as the town could not be effectively cleared by an advance into its front, it was decided to land at Bizoton and enter the town on its south flank. This gave the troops a march of two miles on a broad road before resistance was expected, and afforded time to straighten out the men and get them in hand and in proper formation before coming under fire. It also permitted an advance through the town with one flank resting on the water front where it could be supported readily by armed launches, and in a direction which would allow the use of the ship's guns on the landing force's front without endangering our own men, should it become necessary to open fire from the ship. This plan, further permitted a free use of the ship's guns in a more sparsely settled area to cover the actual landing, when the men would be in boats in an unfavorable formation for meeting an attack. In short, it

. . . .

CRUISER SQUADRON,
U. S. ATLANTIC FLEET,

U. S. S. WASHINGTON, Flagship,

Campaign Order Number Four.

PORT AU PRINCE, HAITI,
Twenty-eight July, fifteen, four p. m.

FORCES:

(a) *Landing Force*
Captain George Van Orden.
Washington:
Two companies marines.
Three companies seamen.

(b) *Support*
Washington 10"-6"-3" guns.
Armed Launches.

1. French and Dominican legations entered by mobs yesterday and this forenoon and General Oscar and President Guillaume forcibly removed and killed.

No government or authority in PORT AU PRINCE.

French Cruiser Descartes expected PORT AU PRINCE tonight.

2. This force will occupy PORT AU PRINCE for the purpose of protecting life and property and preserving order.

3. (a) *Landing Force* land at once on beach near BIZOTON. Begin advance to occupy PORT AU PRINCE as soon as landed.

(b) *Support* support Landing Force operations.

Washington cover landing of Landing Force and support its advance to PORT AU PRINCE. Be prepared shift berth promptly to position off FORT ISLET.

Armed Launches in command Lieutenant Rhodes support left flank Landing Force and cover Water Front of town.

(x) Anticipate resistance. Avoid injury to non-combatants and their property.

4. Lieutenant Rhodes, Washington, take charge transportation of Landing Force to beach; assume duties of Beachmaster; return boats, less armed launches, to ship when landing is completed.

Washington provide maintenance and subsistence for Landing Force.

5. Squadron Commander on Washington. Use Flagship time.

Washington, armed launches, and Landing Force maintain signal communication.

(Sig) W. B. CAPERTON.
Rear Admiral,
Commanding Cruiser Squadron.

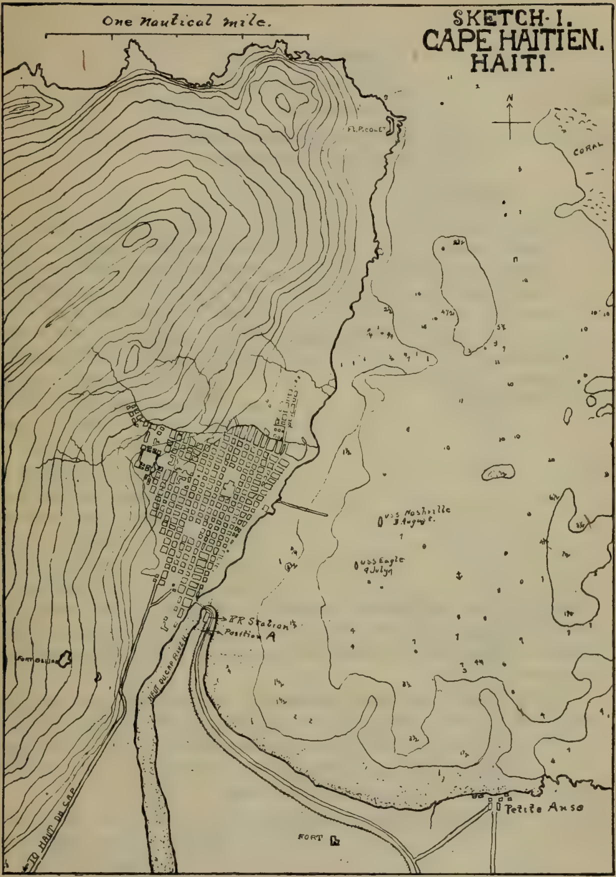
One nautical mile.
SKETCH I.
CAPE HAITIEN.
HAITI.
N
CORAL
FT. PICOLET
USS Nashville 3 August
USS Eagle 9 July
RR Station
Position A
HAUT DU CAP RIVER
FORT BELAIR
TO HAUT DU CAP
FORT
Petite Anse

FIG. 1

LANDING FORCE,
CRUISER SQUADRON,
U. S. ATLANTIC FLEET,

Field Order No. 1. PORT AU PRINCE, HAITI,
Twenty-eight July, fifteen.

TROOPS:

(In column facing East)
(a) *Advance guard*
Captain Giles Bishop, Jr. M. C.
Second Battalion.
(b) *Main body*
First Battalion (less third company)
(c) *Rear guard*
Ensign C. H. Jones
Third company.

1. No information other than that contained in bulletins already issued. The United States forces will occupy the city of PORT AU PRINCE. The Landing Force will be supported by the batteries of the Washington and ships boats.

2. This Landing Force will land on the Beach, East of the NAVY YARD, and form for advancing on the city.

3. (a) The advance guard will immediately after landing, march 300 yards East of the boats and establish march outpost.

(b) The companies of the Main Body will form column facing East on the road abreast the boats. Each company will send a patrol of two men, 100 yards South of the road to provide security until the march begins; these patrols will rejoin their companies promptly upon the signal to march.

(c) The rear guard will, immediately after landing, move 100 yards West of the boats. Patrols will be sent through the NAVY YARD and BIZOTON; they will keep in constant communication with the rear guard.

(x) Companies will open fire only upon orders from a commissioned officer. Patrols will fire only in self defense.

4. Messages and reports will be sent to the head of the Main Body.

/S/ GEORGE VAN ORDEN,
Captain, U. S. M. C.,
Commanding.


SKETCH-2.
PORT AU PRINCE.
HAITI.
One nautical mile
FT ALEXANDER
LEGATIONS AND
Foreign
FT LEREBOURS
ROUTE OF ARMED LAUNCHES
Landing Force advancing on city
BIZOTON
FT BIZOTON

FIG. 2

was proposed to make a flank attack, rather than a frontal attack.

The landing so late in the afternoon was undesirable as it brought the men into the town at night, with all the disadvantages of night fighting with raw troops. However, after a careful estimate of the situation, it was decided that the necessity of controlling affairs at once was so compelling that the disadvantages of night operations must be accepted. On entering the harbor the *Washington* had immediately taken a position, in accordance with plans prepared some months before, which placed her as close to the beach as possible and which gave effective support to the landing force in its landing, advance to, and entry into the city (Position C, Sketch 2). It was further planned for the *Washington* to shift berth to a position off Fort Islet (Position D, Sketch 2), after the landing force entered the city, so as to be able to fire into the city, if this should become necessary, without endangering our own men as they advanced to the northward. In addition, two armed steam launches were to keep abreast of the landing force to give support to its left flank. The campaign order covering this landing operation is attached. (See page 1328.)

The plan was carried out as thus outlined. The landing force completed its landing at 5:48 P. M., July 28, and began its advance at 5:50 P. M., in accordance with the orders of the commander of the landing force. (See page 1330.) Upon reaching Fort Lerebours the advance guard deployed with its left flank on the water front and with one section to a street to cover the first five principal streets running north and south. The advance guard immediately proceeded north along these streets to Rue des Casernes at the center of the city. The main body moved to the right flank of this line and, with a section in its front, a squad on the next street to the right as a flank guard, and with the remainder concentrated as a reserve, it moved in the right rear of the line toward the New Caserne. The landing force thus stretched across the native district of the city to sweep all resistance before it. The right reached almost to the foreign section, from which little trouble was anticipated. The reserves were held in rear of the right flank to extend the line in that direction most promptly should trouble develop there.

As the advance began it became dark. During this advance considerable sniping occurred along the entire front of the left of

the line from civilians and soldiers. The resistance, however, was not organized and was promptly cleared away. None of our men were hit, but two Haitians were killed and ten wounded, including an officer. All armed Haitians were disarmed as they were encountered and a large amount of ammunition, rifles, and other war material was seized.

Upon arrival at Rue des Casernes the line halted and a guard was sent to the French legation. At the President's palace, which is next to this legation, a mob was encountered, which was, however, more noisy than hostile. In this mob was found General E. E. Robin, the commander of the Haitian revolutionary forces in Port au Prince. This officer was informed of the entry of the American forces and their purpose and was persuaded to accompany the commander of the landing force—Captain Van Orden—in an endeavor to prevent any further hostilities. The landing force had now passed beyond the foreign colony and resistance had practically ceased upon the arrival of the line at the Rue des Casernes. As it was now quite late, it was thought best to secure what had been covered and go into bivouac for the night. The twelfth company of marines was accordingly sent to guard the foreign legations and colony. The marine detachment of the *Washington,* however, proceeded on to the northern part of the city and went into bivouac at the Valliere market. The seaman battalion was sent to the same place. No resistance was encountered in these moves. Captain Van Orden and General Robin during the night visited different parts of the city; and together quieted the Haitian soldiers and otherwise prevented further firing and disorder.

The next day the *Washington* moved to the position off Fort Islet and the city was further secured: patrols were established, Haitians disarmed, armed bodies prevented from entering from the country, and arms and ammunition confiscated. During the few days following similar measures were taken for increased security. The marine guard from Guantanamo reënforced the landing force on July 29.

In this manner was Port au Prince occupied and military control assumed. That serious resistance was not encountered, was due to the prompt landing, the rapid and definitely directed advance, which did not allow the Haitians sufficient time to

prepare or to concentrate and gather their courage, and to the personal efforts of Captain Van Orden in visiting the Haitian detachments and securing the co-operation of their general. Some effect was also obtained by a previous warning, prior to the landing, carried to the Haitian leading men by Captain E. L. Beach, U. S. N., and Lieutenant J. N. Ferguson, U. S. N., to refrain from hostile acts and to all foreigners to keep within doors and show the flags of their nationalities. With the exception of some sniping on the night of July 29-30, some little unrest at times, and some other minor disturbances, Port au Prince remained orderly and quiet thenceforth.

At 10 P. M., July 28 a despatch was received from the Navy Department stating that the State Department desired that forces be landed at Port au Prince for the protection of foreign interests.

On July 29, after the city was occupied, Captain E. L. Beach, U. S. N., was sent ashore to assume the chief military functions and such civil functions as conditions might warrant.

On July 30 the French cruiser *Des Cartes* arrived at Port au Prince.

EFFORTS TO BRING GENERAL PEACE

Although there was now no government in Haiti, the fighting between the ex-government and revolutionary forces in the north continued. It was therefore thought highly desirable to take such means as were available to stop this fighting and to get the principal Haitian leaders to Port au Prince for a conference with the American officers, with a view of forming a new government. The Haitian Congress, which elects the President, was in session at this time and became anxious to proceed with the election. It was, however, restrained, pending conference with the Haitian leaders and the quieting of the excitement. To bring about a cessation of the fighting in the north a commission was formed by Rear Admiral Caperton of four prominent Haitians, the archbishop of the Catholic Church, and an officer of the admiral's staff to act as chairman and the United States representative. This commission proceeded to North Haiti and consulted with the leaders of the opposing forces at their headquarters.

While this commission was at Cape Haitien, the ex-government commanding general, Probus Blot, deserted his troops and went to Santo Domingo. Upon this, disorder broke out in Cape Haitien

and the Bobo troops attempted to enter. The ships present, which now consisted of the *Nashville* and *Eagle* under the command of Commander P. N. Olmstead, U. S. N., immediately landed their troops; occupied the position on the Petite Anse Road to prevent the entry of Bobo's forces (Position A, Sketch 1); contained in the property of the church and on the Haitian gunboat, *Nord Alexis,* the ex-government forces, which without a leader had sought refuge there; opened fire with the *Eagle's* guns ahead of the Bobo troops, who were advancing along the Petite Anse Road into the town, and drove them back; established guards and patrols; seized all arms and ammunition; and thus in the course of a few hours had effectively occupied Cape Haitien without loss of life or unusual disturbance. The action of Commander Olmstead at this time was most opportune. By its rapidity and definite direction, he had seized the second city of Haiti in the midst of the contending factions and thus prevented to a large extent serious disturbances in that area.

Upon the desertion of Blot the ex-government faction dissolved, with the exception of the ex-government troops under General Bourand, who were still holding Ouanaminthe and the frontier in that vicinity. Bourand was therefore the principal leader remaining in arms against Bobo.

The Caperton commission induced all factions to cease fighting; and persuaded Bobo, twenty-six of his generals, and Bourand, to return with it to Port au Prince for a conference with the Admiral. The leaders agreed to hold their troops in the positions then held, pending the results of the conference. Upon arrival at Port au Prince the rival leaders were informed that they would not be allowed to become factors in the political situation as long as they had troops under their command. Accordingly, both Bobo and Bourand sent telegrams to their various chiefs to proceed to Cape Haitien and turn in their arms to the American forces there.

On August 4 the second marine regiment arrived at Port au Prince on the *Connecticut* and the commanding officer of the regiment, Colonel Eli K. Cole, U. S. M. C., assumed the military duties on shore at that place.

Every effort was made to disarm and disband all Haitian soldiers who could be rounded up. The ex-government forces,

which were captured by the *Nashville* and *Eagle* at Cape Haitien, were sent to Port au Prince; and there paid off and disbanded to the number of seven hundred and sixty-six. All men under arms not within the American lines were offered a fair price for their rifles, if they would come in and surrender them to the American forces. In this way several thousand rifles were obtained, and, in addition, other war material was seized. The *Connecticut,* after landing the second regiment at Port au Prince, proceeded to Cape Haitien and on August 6 reinforced the *Nashville* and *Eagle* at that place. It was found necessary at this time to take action against revolutionary activity, which still survived in the form of "revolutionary committees" in Port au Prince and Cape Haitien. These committees were accordingly dissolved and informed that further activity on their part would not be permitted.

THE FORMATION OF THE NEW GOVERNMENT

With the arrival of the principal leaders in Port au Prince and the establishment of more quiet and peaceful conditions, the election of the president by the Congress was allowed to proceed. It soon developed that the principal candidates were Bobo and Sudre Dartiguenave—the president of the senate. Bobo's support depended entirely on his ability to control armed forces and their time-immemorial power of exerting military pressure on the Congress. In order to prevent further military intimidation of this nature, Port au Prince was combed to clear from the town all ex-soldiers and especially the Cacos, who were in the town upon our entry to the number of about fourteen hundred. These Cacos were the lawless bandits of the north, who were the mainstay of all revolutionary armies. They possessed the greatest fighting ability of any class of Haitians; and, by their military organization, when bought by the various revolutionary leaders, had been the controlling factor in Haitian politics for many years. To them and the unscrupulous leader who hired them, had been due the constant turmoil of revolution in the country. With Port au Prince carefully guarded against outbreak, the election was held on August 12. Dartiguenave was elected president. Bobo left the country and went to Jamaica. Bourand accepted the situation and retired to private life. Instructions were soon received from Washington to support the Dartiguenave government.

PRELIMINARY TREATY NEGOTIATIONS

It was early recognized that the time was most opportune to bring to a successful conclusion the negotiations, relative to the United States control of customs, finances, and other matters, which had been pressed diplomatically, off and on, with Haiti for many years previous, without success. The sentiment of the Haitians and the situation in this respect were carefully estimated; and, as a result, the State Department was urged to renew its efforts along these lines at this time. The State Department accordingly, through the American Chargé d'Affaires, Mr. R. B. Davis, submitted to the Haitian government a preliminary draft of a treaty on August 17. This treaty provided for direct American control of customs, supervision in an advisory capacity of all government finances, the organization of an American officered constabulary which should be the sole military force in Haiti, and have the sole charge of all military material and its traffic, and the right of American intervention to suppress trouble and to enforce the provisions of the treaty.

THE CONSOLIDATION OF UNITED STATES CONTROL

On August 15 the first regiment of marines arrived at Port au Prince on the *Tennessee*, thus forming an expeditionary force of two regiments (four battalions) of marines, under the command of Colonel L. W. T. Waller, U. S. M. C. One battalion of the first regiment was sent to reënforce the troops at Cape Haitien and the remainder was landed at Port au Prince. These troops were afterwards reënforced by a battalion of marine field artillery. In order to insure the food supply to Port au Prince and to make more secure the American position, the towns of St. Marc, Petionville, and Leogane were occupied as advanced posts.

On August 19 orders were received from the Navy Department to assume charge of all custom houses at the maritime ports of entry of Haiti, except Mole St. Nicolas, Aquin, and Fort Liberte. It was further directed that all revenues thus accruing be collected and applied to the organization of a constabulary, to the carrying on of public works to provide employment for the destitute, and to support the Dartiguenave government; and that the remainder be held in trust for the Haitian people. In accordance with these

CRUISER SQUADRON,
U. S. ATLANTIC FLEET,
U. S. S. WASHINGTON, Flagship,

Campaign Order Number Nine — PORT AU PRINCE, HAITI, Five September, Fifteen; Ten a. m.

FORCES:

(a) *First Detachment*
Captain E. H. Durell
Connecticut
Nashville
First Regiment Infantry less Second Battalion.
One Battery Field Artillery.

(b) *Second Detachment*
Commander J. F. Carter
Castine
Seventh and Twenty-Fourth Companies Infantry.

(c) *Third Detachment*
Major N. H. Hall
Sixth and Twelfth Companies Infantry.

(d) *Fourth Detachment*
Commander L. McNamee
Sacramento
Fourth and Seventeenth Companies Infantry.

(e) *Main Body*
Washington
Marietta
Eagle
First Brigade Infantry less One Battalion and Six Companies.
One Battalion Field Artillery less One Battery.

1. The Cacos still remain in arms in North HAITI. South HAITI is at present quiet. Negotiations relative to the treaty with present HAITIAN government are continuing. This government without funds and not at present strong; efforts to strengthen and support it are continually underway.

2. This force will assume and maintain military control of the ports of entry of HAITI and collect customs thereat; pending negotiations between UNITED STATES and HAITI.

3. (a) *First Detachment* maintain military control PORT DE PAIX and military government CAPE HAITIEN. Nashville patrol PORT DE PAIX and CAPE HAITIEN. Connecticut support these operations.

(b) *Second Detachment* maintain military control ST. MARC and GONAIVES. Castine patrol ST. MARC and GONAIVES and support these operations.

(c) *Third Detachment* occupy JEREMIE. Maintain military control PETIT GOAVE and MIRAGOANE.

(d) *Fourth Detachment* occupy LES CAYES (AUX CAYES) and JACMEL. Sacramento patrol LES CAYES and JACMEL and support these operations.

(e) *Main Body* will maintain military control under martial law at PORT AU PRINCE. Washington support these operations. Marietta patrol PETIT GOAVE, MARAGOANE and JEREMIE and support Third Detachment. Eagle continue repairs.

(x) Maintain military control and administer customs at all ports occupied. Protect life and property and preserve order. Disarm all HAITIAN troops encountered.

4. Base is at GUANTANAMO. Osceola will make trips between base and various detachments with stores, mail and provisions. Jason and Solace remain PORT AU PRINCE for the present.

5. Squadron Commander on Washington. Make daily and such other reports as may be necessary to keep Squadron Commander fully and frequently informed of the situation. Use seventy-fifth meridian mean time.

(Sig) W. B. CAPERTON.
Rear Admiral
Commander Cruiser Squadron,
Commanding United States Forces
in Haiti and Haitian Waters.

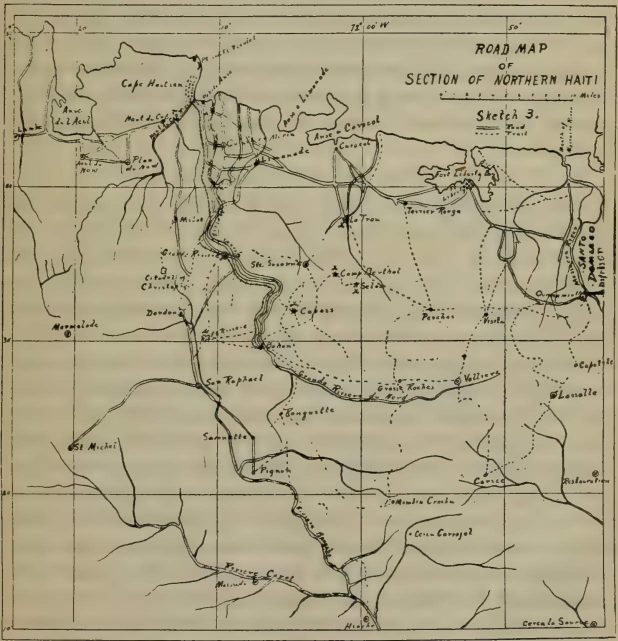

FIG. 3

orders all the ports of entry mentioned were occupied. A company of marines and a gunboat seized each port and paymasters of the navy assumed the duties of collectors of customs and captains of the port. By acting in each case promptly and with sufficient force to overwhelm at its inception any resistance, all the ports were occupied without loss of life. In this manner the ports of Jacmel, Les Cayes, Jeremie, Miragoane, Petite Goave, Gonaives, and Port de Paix, in addition to those already held, were occupied. These ports extend along a coast line over five hundred and fifty miles in length. Aquin and Fort Liberte were occupied later. The order covering these operations is attached (Fig. 3).

Paymaster Charles Conard, U. S. N., was appointed administrator of customs and fiscal officer. Under him were organized and administered the custom service and the fiscal administration. This latter developed into one of the most difficult and exacting of the duties performed in Haiti, as American control of finances finally expanded to embrace the whole Haitian financial system—probably unrivaled in its complexity and disorganized condition.

THE FALL OF THE CACOS

After the elimination of Bobo and Bourand, their troops, feeling that they had been deserted, not having obtained their pay, and now being shut out of the ports of entry where they had heretofore looted the customs receipts, defied the orders of their chiefs to disband at Cape Haitien and began robbing and pillaging. These forces closed in on Cape Haitien and Gonaives in particular, and cut off the food supply and in the latter town the water supply also. Many acts of depredation against foreign property, the farmers, and the market women were committed. These forces consisted mostly of Cacos, who after the departure of the chief leaders, broke up into small bands under local chiefs. Continuous effort was made from August 3 to induce these bands to come within the American lines, receive pay due them for their former service as soldiers, and deposit their arms. Various conferences with different chiefs were held by American officers and representatives of the Haitian government with this end in view. An attempt was made to induce the National Railroad of Haiti—an American corporation—to begin new construction work on its road under military protection with a view of inducing the Cacos

to go to work. But all this was of no avail. The marauding and banditry continued. By the middle of September the Cacos became so annoying and their blocking of the food supply to Cape Haitien and Gonaives so serious, that more stringent action became necessary.

The commander of the expeditionary force—Colonel Waller—accordingly made a reconnaissance along the Cape Haitien–Grande Riviere Railroad (Sketch 3), and consulted with various Caco chiefs. As a result the railroad was opened and the famine conditions in Cape Haitien relieved. The same action was taken at Gonaives; and the railroad from Gonaives to Ennery was opened, but not without resistance from the Cacos, who opened fire on our troops and attempted to tear up the railroad. They were dispersed with a number killed and wounded. In order to insure no further molestation of the food and water supply to these two towns, orders were issued to keep the railroads and the roads entering them continuously open. The coffee crop in transit to these ports, which is the largest source of income to the industrious portion of the inhabitants, was also being held up by the Cacos; and the importance of securing free access for this crop added to the necessity of this move. The railroads were accordingly kept open from this time on and patrols were sent out on the main roads.

On September 26 two American patrols were attacked on the Haut du Cap–Cape Haitien and the Petite Anse–Cape Haitien Roads. Reënforcements were sent to these patrols from Cape Haitien and the Cacos were driven away with a loss of fifty killed and a large number wounded. The American forces suffered ten men wounded. On this same day another engagement between the Cacos and a patrol occurred at Petite Riviere de L'Artibonite. The Americans lost one man killed, no wounded. The Cacos lost three men killed and nine wounded.

In order to keep peace and order more effectively and to control the situation, martial law was declared by Rear Admiral Caperton in Port au Prince on September 3; and extended to all places occupied by American troops on September 20. This had a most salutary effect for betterment of conditions and made more definite the status of the forces on shore.

Efforts were continued to induce the Cacos to surrender their arms and disband by the offer of their pay and the granting of amnesty by the Haitian government. On September 28 a written agreement was finally reached in which the Cacos agreed to surrender their arms on definite dates to the American forces and to submit to the authority of the Haitian government. The Cacos in return were to receive 50,000 gourdes for each 1,000 soldiers with serviceable rifles. It was further agreed that any Cacos found in arms, after the dates on which the arms were to be turned in, were to be treated as bandits. Although bound by this agreement, the Cacos by dilatory and delaying action completely evaded its terms—comparatively few arms were surrendered and marauding and pillaging broke out afresh. This was probably due to the weak hold the big chiefs had on the smaller ones, the inclination of the Cacos to live by pillage rather than by peaceful work, and the agitation of irresponsible persons who for one reason or another were opposed to the Dartiguenave government and the American occupation. Toward the end of October sniping against the American patrols grew worse and finally culminated in an attack on the American forces at Le Trou (Sketch 3). The Cacos were repulsed in this attack with six killed. The Americans had one man wounded.

These occurrences necessitated systematic operations to clear North Haiti of the Caco bandits. The area occupied by them at this time was in the northeast corner of Haiti, contained within the line Cape Haitien–Dondon–St. Raphael–Pignon–Carice–Ouanaminthe–mouth of Massacre River–Cape Haitien—about seven hundred square miles (Sketch 3). The plan adopted was to divide this area into two parts, separated by the line of the Grande Riviere; to clear first the eastern part and then the western, using the railroad for communication and supply purposes. The eastern part was to be entered from the north and from the south, while forces held the line of the railroad and the Grande Riviere as far south as Bahon, and the border and eastern side as far south as Valliers. In this manner Forts Capois, Berthol, and Selon—important Caco strongholds—would be attacked. Then the western part would be cleared, including Fort Riviere, the most difficult of all strongholds, due to its strength and inaccessible position on the top of a mountain over twenty-five hundred feet high.

A force of about one thousand marines and seamen were collected in the north and under the command of Colonel Waller began these operations on November 1. By the fourteenth, after continuous skirmishing with the Cacos, Forts Capois, Berthol, Selon, and the neighboring strongholds were captured and the districts in their vicinity cleared. In these fights the Cacos would not stand, but with their superior knowledge of the trails managed to escape each time. It was soon learned that what was left of organized resistance was gathering at Fort Riviere. It was therefore recognized that if the Cacos at this place could be forced to stand, the campaign could be brought to a definite conclusion in one blow.

The location and approaches of Fort Riviere were accordingly thoroughly reconnoitered. The plan was to drive in the various Caco outposts and to advance simultaneously on the fort from four directions: one column from the northward via Dondon, another from the westward and southward via San Raphael, one from the eastward, and one from east and southeast via Bahon. In addition other troops closed the remaining routes of escape. The movement was executed as planned. On November 17, after a spirited engagement involving ten minutes of hand to hand conflict, Fort Riviere was captured and the last organized resistance and the reign of the Cacos destroyed.

This little campaign lasted less than three weeks—from November 1 to November 17. During that time over five hundred square miles of country were covered. This country is of a most difficult and mountainous character, covered with thick tropical growth, and pierced almost solely by rough foot trails. The men marched and fought continuously, sometimes covering twenty miles a day and most of it hard mountain climbing. Bluejackets, clad in khaki, vied with marines in their efforts; and after a few days seasoning became good "hikers". The American losses amounted to only one officer and one man wounded. That there were not more is a monument to the discipline and training of the personnel. The success of the plan was in a great measure due to the efficiency of supply and communication organized by the marines, and to the "spirit of the offensive," which drove the troops after the Cacos wherever they could be found.

COMPLETION OF THE TREATY NEGOTIATIONS AND RECONSTRUCTION

With the capture of Fort Riviere all trouble in North Haiti ceased, and peace was brought to the entire country. By the end of 1915, Haiti throughout was quiet; peaceful pursuits were being resumed; farms, houses, and villages were being rebuilt; sections, of late years depopulated, reinhabited; and the general aspect of the country was one of returning prosperity. American troops continued to patrol all districts, but were gradually finding helpful aid in the newly organized constabulary, which, under the training and guidance of marine officers, amounted on February 1, 1916, to thirteen hundred well equipped men. Outside of the usual petty thievery and minor conspiracy, no further disturbance was anticipated.

From August 17 the treaty negotiations continued, with many "pourparlers" and discussions. On September 16 the treaty, substantially as submitted by the United States, was signed by the plenipotentiaries of the two governments and on October 6 and on November 11 ratified by the two chambers of the Haitian Congress. Upon signing the treaty the Dartiguenave government was recognized by the United States. On November 29 a "*modus vivendi*," placing the treaty into full working effect pending ratification by the United States Senate, was signed; and on December 6 a commission of Haitians proceeded to Washington to arrange details for its operation.

It was thus by these military operations with the attendant martial law, the seizure of control of all Haitian finances, and the successful accomplishment of the treaty negotiations, that a century of bloodshed was brought to an end and Haiti was placed under the virtual protectorate of the United States. The United States assumed, by these acts, the responsibility of insuring that its own important interests in this area and the interests of other nations and humanity in general would be henceforth served in peace and profit.

U. S. S. "DeLong" Ashore at Half Moon Bay

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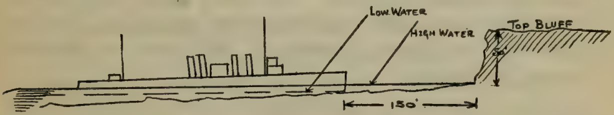
U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SALVAGE OF THE U. S. S. "DeLONG" (#129)

By Lieut. William Nelson, (CC) U. S. Navy

The Destroyer *DeLong* while en route from San Diego to San Francisco running in a fog at about ten knots grounded about two and a half miles south of the northern end of Half Moon Bay, California, at 2:43 A. M., December 1, 1921.

The vessel was being steered a course of 42° true, accompanied by the *Babbitt* and the *Tatnall*, the *DeLong* leading; and by emergency signals warned both the *Babbitt* and the *Tatnall* sufficiently in advance to keep them clear. Although a heavy surf is running continuously in the vicinity of Half Moon Bay, the officers reported that no indications of their being in shoal waters were evident until the ship struck bottom. Breakers during normal winter weather break about four hundred feet from the shore line in about two fathoms of water.



Section
Showing Position of
U.S.S. DeLong When
Aground

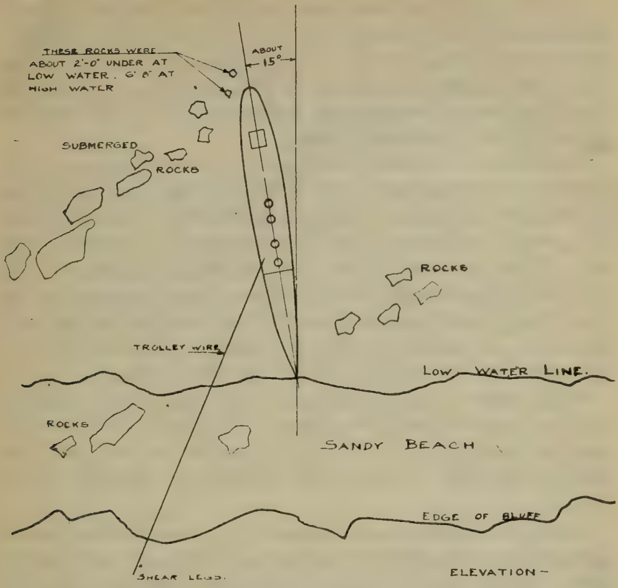
Immediately upon grounding the order was given to "back full," "left full rudder," and "sound the siren." The general alarm was sounded, break-down lights were turned on and word passed to close all water-tight doors. The boilers were running on the after fuel oil tanks. Suction was lost shortly after the engines had begun to "back." Efforts were made to get up steam

again but evidently due to broken joints in the oil line the attempts were unsuccessful. Water commenced entering the engine rooms and the after boiler room through strained seams and rivets. No holes in the shell plating were noted. Orders were given to "secure" below and for all hands to come on deck for muster. Exact conditions as regards the shore line were not known but it was thought best not to lower a lifeboat. The port anchor was dropped but orders were given not to take a strain on the cable. All weather deck hatches were closed.

The next morning an inspection of the vessel throughout revealed that all compartments forward of the forward boiler room were tight. The shell plating and one frame in the forward magazine were bent but no signs of leakage appeared. A little water was being taken in the forward fire room but the source could not be ascertained. The two stanchions in front of the boilers were slightly bent. The after fire room had a bulge in the shell on each side of the keel under the floor plates, and a stanchion on the starboard side between the boilers had buckled at the head and had bent the deep beam. One pump frame was bent and fuel oil lines were bent. Water was being taken quite rapidly in this compartment. In the engine rooms the shell plating on the starboard side was dished considerably. Frames and pipe lines in the bilges were badly bent, fuel oil was entering these compartments from the after fuel oil tanks. The port low pressure turbine was cracked. The shaft alleys were flooded to within three feet of the top with fuel oil and water. The after magazine had seven feet of water in it. The other compartments aft seemed to be tight.

The tide at the time of grounding was about two hours after high water. The highest spring tide of the month came the day of the grounding, but owing to lack of facilities for pumping no advantage could be taken of that tide. Further, the increased draft of the vessel due to her taking water made it more doubtful than ever that she could be removed without pumping.

During the flood tide of the following day the vessel moved further inshore about fifty feet, placing her in the position shown on sketch "A" and that position she held until she was finally pulled off.



SKETCH "A"
SHOWING RELATIVE POSITION OF
U. S. S. DELONG
WHEN AGROUND AT HALF MOON BAY.

The bottom in Half Moon Bay is sand and rock—the rocks running in strata at an angle with the shore line. In some places these outcroppings of rocks come up in pinnacles quite close to the surface of the water. The rocks in the vicinity of the *DeLong* when aground are shown in the sketch. In addition to those shown, there is reason to believe that there were one or two rocks under the ship itself, but since they were not seen they are not plotted. The strata of rocks on the beach if plotted out would place a rock under the after boiler room of the vessel. (This is presumed since a stanchion in this compartment was buckled more than any other.)

To arrive in the position shown on the sketch from the course steered the vessel evidently went over the reef at her starboard quarter and in all probability was punished more there than at any other time during the period she was aground.. It should be noted that the surf running was sufficient to lift the *DeLong* over this reef with considerable ease.

The destroyer grounded finally so that her bow was just at the low water beach line, the fore and aft line of the ship being on an angle of about 15° with a perpendicular to the shore line. The ground swells came in on the port quarter at an angle of about 30° with the fore and aft line of the vessel. It is presumed that the rocks supported her in the position shown because had she been free the seas would have turned her broadside to the beach with ease. A bluff about fifty feet sheered up about one hundred and fifty feet from the bow of the ship as she lay.

On December 1, with the aid of a Coast Guard crew, a breeches buoy to the lower beach was rigged. The shore end of this line was later moved up to the top of the bluff in order to keep clear of seas that a storm might bring up to the base of the bluff.

During the afternoon of December 1, it was decided that all operations in connection with salvaging would have to be undertaken from the beach. This in view of the condition of the surf and the nearness of the vessel to the shore. In this connection it might be well to mention that relatively few salvage operations are undertaken from the shore, because in most cases there is sufficient water alongside the vessel grounded, to permit taking a light draft tug or barge alongside with pumps and other gear, and operating in general from the seaside of the stranded ship. However, in this case everything had to be done from the bluff one hundred and fifty feet from the bow of the *DeLong.*

So it was decided that the *DeLong* should be loaded down with water in enough compartments to make her rest securely on the bottom at the highest tides until all preparations could be made for pumping her out and pulling her off. This was done to prevent pounding and to prevent the vessel turning broadside to the beach. It was then planned that moorings would be placed to seaward on the port and starboard quarters. Tackles to these moorings would be used to give the vessel her first start off the

ground. Centrifugal gasoline pumps would be placed aboard for controlling the water. A tug with a line aboard to assist in pulling as the vessel was pumped out was to take the ship as soon as one fleet had been taken on the tackles to the moorings. Owing to the small amount of fresh water available it was deemed advisable not to consider using the boilers in the forward fire room excepting in case of emergency; oil suction would have had to be started by a handy-billy.

Facilities on board the vessel were not good. Oil lamps and flashlights were used for lighting while they lasted. The radio had been run on storage batteries until the batteries had practically gone dead so that at the time of grounding very little power was available for signalling by radio. About three or four thousand gallons of fresh water in the cofferdam was still usable in case of necessity. The galley was run on wood gathered from the beach which required considerable time and labor. Most of the heads became clogged with sand presenting additional difficulties.

The *DeLong* had a crew of about sixty men at the time of grounding. In view of the program to be followed and in view of the conditions on board it was arranged that only half the crew would remain for salvage operations, the remainder to be transferred overland to the nearest receiving ship.

To carry out the plan for flooding compartments orders were given to flood full the fore peak, the commissary storeroom, the construction storeroom, the after peak and the steering engine room and to flood to the level of the floor plates in the forward fire room. The water in the engine rooms and the after fire room rose and fell with the tide, lagging somewhat. Marks on the bulkhead indicated that the vessel had rolled about 20° to the side since these compartments had taken water. It was believed that this weight of water would be sufficient to keep the vessel steady unless extremely high tides accompanied by a heavy sea occurred.

The means to be employed for flooding consisted of a handy-billy and a bucket line. It was later found that the suction to the handy-billy became clogged with sand upon the slightest provocation. The bucket line was slow. The steering engine room was flooded easily by removing the main deck hatch and allowing the seas breaking over the vessel's stern to fill this com-

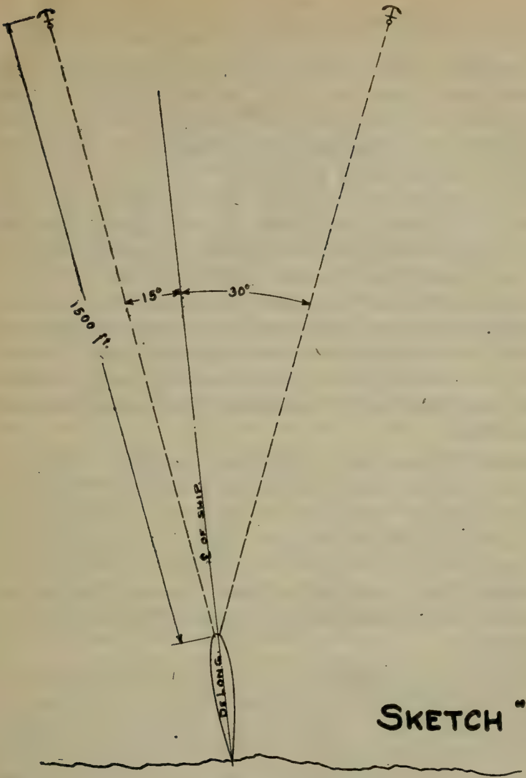
partment. The boiler room was flooded by opening a connection to the sea. The commissary storeroom was flooded by the bucket line. No means of flooding the construction storeroom and the fore peak seemed to exist.

Soundings taken around the vessel at high water gave depth of water as follows:

Frame	*Starboard*	*Port*
22	1¾ fathoms	1½ fathoms
32	1¾ fathoms	1½ fathoms
42	1¾ fathoms	1½ fathoms
52	1¾ fathoms	1½ fathoms
62	2 fathoms	1¾ fathoms
72	1¾ fathoms	1¾ fathoms
82	1¾ fathoms	2 fathoms
92	1½ fathoms	2 fathoms
102	1½ fathoms	1¾ fathoms
112	1¾ fathoms	1¾ fathoms
122	1¾ fathoms	1¾ fathoms
132	1¾ fathoms	1¾ fathoms
142	1¾ fathoms	1¾ fathoms
152	1¾ fathoms	2 fathoms
162	2 fathoms	2 fathoms

On December 2, at high tide the ship became very restless, rolling 4° or 5° to the side. This made it important that more water be taken aboard, so orders were given to flood the forward boiler room, six feet over the floor plates. In addition a drainage line from the steering engine room to the construction storeroom was broken in the storeroom, flooding that compartment from the sea through the main deck hatch in the steering engine room. This seemed to secure the ship so that there was practically no movement whatsoever.

Arrangements were made to have a tug lay two 5,000 pound anchors as shown in sketch "B" and to pass wire lines from these anchors to the *DeLong*. The chart showed six fathoms of water where the anchors were to be planted. The anchors were actually planted so that the mooring on the port side was 17° on the quarter at a distance of 1,406′ and the mooring on the starboard quarter 5° at a distance of 1,336′. Since time was the essence of the undertaking the moorings were left as planted the first time. The object of the larger angle on the port quarter was



SKETCH "B".

SHOWING LOCATION OF MOORING ANCHORS
U.S.S. DE LONG, AGROUND.

to pull the vessel away from the rock reef on the starboard quarter.

Orders were given to have one five-inch and one four-inch centrifugal gas pumps, gasoline, suction hose, acetylene lamps,

shear legs, tackles, lines, etc., sent to the vessel overland by trucks.

On December 3, about 7:45 A. M., four trucks arrived with pumps and gear. Steps were taken immediately to set up the shear legs about fifty feet back from the edge of the bluff—back to permit the trucks to run under the outboard side for unloading pumps, etc.—and about 100 feet off to the south from the bow of the vessel so that the pumps could be run into the main deck abaft the forward deck house. It was assumed that the pumps weighing about 3,700 pounds could be handled from that point to any other aft on the ship without difficulty. A "dead man" consisting of a one ton cement block backed up by a ten-foot log laid over the top was buried for securing the shore end of a trolley wire to the ship. Wire straps were used as securing end to the "dead man" so that they could be slipped without reclaiming said "dead man." A snubbing post was set in behind the cement block.

No mention has been made of weather conditions. Ordinarily at this season of the year rain can be expected at practically any time with heavy southwesters prevailing. The soil on the bluff is a dobie clay which when wet makes it practically impossible to handle trucks. So aside from the effect on the vessel itself it was essential that advantage be taken of every single day of good weather, with a prayer that each following day be as good as that preceding.

On the same day, December 3, a one-inch wire line was run from the shear legs ashore to the ship. The shore end was anchored to the "dead man," thence the line was run over a twelve-inch sheave on the shear legs, and from there to the galley deck house on board. The distance from the shear legs to the deck house was 350 feet. This meant considerable sag due to the weight of the line. If it could have been arranged, the end aboard ship would have been placed high enough so that material could have been run right in on deck without rehandling. Nothing as easy as that seemed possible so the ship end of the trolley wire was run around the galley deck house twice and clamped to itself. The slack was taken in on shore by chain falls—a five-ton chain fall with the best available chain snorters was the only thing that gave satisfaction. An objection to this line se-

cured as it was, it pulled on the ship as a whole in the direction tending to move the vessel broadside to the beach. The advantages outweighed the objection.

On board, preparations were made to rig deck tackles for starting the ship from the beach. The decks were cleared on both sides so as to get the longest fleet possible because of the small chance of ever getting time to fleet the tackles out after once having taken a heave. The forward bitts were used as the fix for the blocks. It was estimated that a fleet of about 50′ could be obtained before we would have to let the mooring lines go.

On December 4, the wrecking tug used to lay moorings and whose gear was used for the major portion of the salvaging stood by to send the mooring wires on board the *DeLong*. It was impossible to have the tug come in any closer than about 1,500 feet on account of breakers so it was necessary to use a Coast Guard launch to fire shot lines to the *DeLong*. These were successfully fired with a Lyle gun and 18-pound shot from a distance of approximately 500 feet. The shot line was followed by a five-inch messenger and then a one and three-fourths-inch steel wire line on the port side and one and five-eighths-inch steel line for the starboard mooring. Sufficient power was not available on the *DeLong* for taking these mooring wires without considerable time so the messenger was led through the *DeLong* up to the bluff where the motor trucks were used to do all hauling. The use of the motor trucks and purchases for this hauling proved very successful. The wire lines to the moorings were taken in through quarter chocks and secured directly to the deck tackles. Deck tackles were then used to take in the slack. The securing of these lines on board practically assured the ship against turning broadside to the beach. Naturally the port line was the more important, so greater care was exercised in taking in all the slack on that line.

After further study of the conditions it was decided that additional pumps would be required to handle the water and oil as desired. The ground swells coming in would not permit pumping out compartments in succession without damaging the vessel unnecessarily due to pounding. Further, due to the lift that would exist in some compartments it was necessary to figure on having a steam pump in operation. This steam pump was

also extremely advantageous in removing the oil and in priming the gas pumps. Additional pumping capacity also seemed necessary to take care of compartments that might be damaged when the vessel was pulled off.

The *DeLong* was divided into the following sections for pumping:

Section 1. All compartments forward of forward boiler room.
Pumping: Ship's booster pump and a 4″ gasoline centrifugal pump. (This certifugal pump was not set up but was placed on board ready to be used as needed).

Section 2. Forward and after fire rooms.
Pumping: One six-inch gas centrifugal pump, capacity 900 gallons per minute.

Section 3. Forward engine room.
Pumping: One eight-inch centrifugal gas pump, capacity 1,600 gallons per minute.

Section 4. After engine room, and "D" oil tanks.
Pumping: One eight-inch centrifugal gas pump, capacity 1,600 gallons per minute.

Section 5. All after compartments.
Pumping: One four-inch reciprocating steam pump. (Worthington Duplex).

In addition to the above one five-inch centrifugal gas pump and two handy-billys were to be placed aboard as spares.

The above arrangement of pumping was later changed as will be noted.

On December 5, preparations were made on board the *DeLong* for taking the pumps. It was planned on putting all pumps on the main deck with the exception of those in the boiler room and engine rooms. The deck was burned out for the six-inch pump to the forward boiler room so that it could be landed on the grating about eight feet below the main deck. The engine room hatch to the forward engine room was removed and a swinging platform about four feet below the main deck was arranged for the eight-inch pump to be placed there. The pump for the after engine room was to be placed over the hatch to that compartment.

Additional slack to the moorings was taken in by purchases. This caused the ship to change her heading 5° to the right but

at low tide she moved back to her original heading. It is interesting to note that the *DeLong* seemed to swing back and forth over an arc of about 5° on all high tides after that. This seemed to indicate for a certainty that she was resting on a rock somewhere near the after boiler room.

For working nights, acetylene lamps were used and although very successful for local lighting, they are not good for lighting at a distance.

During the evening of December 5, the additional pumps named above, suction hose, lumber, coal, gasoline, barrels, water, a donkey boiler for the ship, and a donkey engine for the shore end of the trolley, arrived.

The trolley was operated by a four-inch line for easing out and a two-inch line for hauling to the ship. The donkey engine made this particularly easy for hauling the weights down the trolley.

As soon as the gear was rigged, pumps, hose, etc., were sent to the ship. Shear legs on board were used to lift the weights on board after their arrival alongside; the trolley wire could not be set up taut enough to run the weights over the rail.

Even transportation by motor truck presents difficulties. One motor truck weighing eight tons without a load, carrying a load of about ten tons was arrested by the police for traveling overload, the limit of weight allowed being eight tons. Another motor truck loaded, smashed into a ditch bridge which required rebuilding before the other trucks could come in. Invariably on bad pieces of road towing had to be resorted to, to get loaded trucks through.

On December 6, work in connection with landing pumps and gear on board the *DeLong* was continued. Efforts were made by the salvage tug to move the starboard mooring out farther but without success.

The clearance between the edge of the bluff and the trolley wire was not sufficient to permit clear passage for some of the larger weights, so efforts were made to blow out the bank with black powder. All reasonable weights of powder had very little effect—picks and shovels had to be resorted to eventually.

In view of the time required to take a fleet on the deck tackles it was planned that as soon as the *De Long* had been started from the beach, the salvage tug and the navy tug would take a strain

on their lines to the *DeLong* and keep her moving until she reached deep water. To this end it was arranged that the salvage tug would have a one-inch wire line and the navy tug a ten-inch manila line.

The one-inch wire line was passed to the *DeLong* and taken in through the stern chock and made fast. The ten-inch manila line was not to be run until just prior to the actual pulling on account of possible damage to the line through chafing.

The six-inch pump in the forward fire room was tried out as soon as it was set up. It pumped that compartment practically dry in fifteen minutes. The compartment was flooded again before high water.

Calculations were made for stability assuming location of center gravity and assuming free water in practically all lower compartments. No *Inclining Experiment* booklets were on board, so at best the calculations were only approximate. However, they showed that sufficient metacentric height existed for any moderate conditions. Calculations were also made for capacity of pumps and water to be handled, etc. These calculations proved that capacity was satisfactory.

On December 7, miscellaneous gear was put on board the *DeLong*. The pumps throughout were tried and found to control all waters with considerable ease. When the six-inch pump in the forward fire room was run with suction in the after fire room the water in that fire room and in the two engine rooms dropped simultaneously indicating that those three compartments were open to each other. No changes in pumps and suctions were thought advisable, however, because of the desire to have the pump capacity there. This later proved desirable because the openings between compartments were comparatively small, making it more desirable for each compartment to have its own pump.

In view of the difficulty of handling oil with a centrifugal pump the oil in the engine rooms and in the after oil tanks was pumped out with the four-inch steam pump and sea water allowed to come in to replace the oil pumped out.

Efforts were made at various times to pick up the port anchor, that had been dropped shortly after grounding, both by the use of the capstan and by lines to the bluff, but the anchor chain had

become so fouled in the rocks that sufficient power was not available to break it out. Since plans were developing for pulling the vessel as soon as possible, it was deemed advisable to slip the anchor and forty-five fathoms of chain cable.

Weather conditions had been quite favorable up to this time with a moderate swell running continuously. It was feared that good weather would not prevail much longer, so plans for pumping out and inspecting were cancelled and arrangements were made for pumping and pulling the vessel off the beach at high tide between 6:00 and 7:00 A. M. the eighth of December.

A five-sixteenths-inch wire line had been run as a messenger for the ten-inch going to the navy tug, but it carried away before the ten-inch line was bent on. It was then too late to try another messenger so orders were given that in case of a pull the next morning the two tugs would pull in tandem on the one-inch wire line to the *DeLong*. To reduce the breaking of the surf as much as possible fish oil was put over by the salvage tug beginning at midnight. This fish oil had very little or no effect whatsoever on the breaking of the surf. This result was predicted since the waves were made by ground swell and not by a wind. The sea was watched during the night for signs of change. Unfortunately the sea kept increasing until at daybreak a very heavy swell was coming in with breakers in six or seven fathoms of water. This was entirely unlooked for, so rather than unnecessarily hazard personnel and material the pulling of the vessel was postponed until more favorable conditions prevailed —waves were coming in three and four a minute. The barometer was steady, the wind north, with a heavy mist.

The heavy seas of that morning had washed up over the ship so as to spray all the pumps on the main deck putting them out of commission until the magnetos could be dried out. It showed however that houses would have to be built over the pumps to protect them. Accordingly houses built up of one-inch lumber with canvas covering were placed over the pumps on the two engine rooms. The doors in the after deck house displayed signs of weakness so they were shored with 2″ x 4″.

It was estimated that the draft when the vessel ran aground was about 9′ mean. If all the water and oil could be removed it was figured the draft would be about 8′ mean. Consequently

to get as much oil out forward as was possible to reduce the draft a steam connection was made from the donkey boiler to the booster pump in the forward boiler room. Although this pump was submerged practically continuously it was run successfully. Only a small quantity of oil was pumped out however, pending a definite date for pulling the vessel.

During December 8, the sea showed no signs of moderating, making it fairly certain that nothing could be done on the morning of December 9. Plans were then made for attempting the pull December 10 on the morning high tide.

On December 9, the sea had moderated a little but waves were still breaking over the stern of the *DeLong*. Gear on deck had been washed around unmercifully making it imperative that additional lashing be done on everything. Doors in the after deck house had been broken in by the seas. These were later straightened, replaced and reshored. In addition the ventilator opening in the after side of the after deck house had shipped so much water that the crew's space aft was flooded up about 4′.

Previously it was arranged to have the two tugs pull in tandem on the one-inch wire line, but in view of the possible necessity of having to pull the *DeLong* off in a moderate sea it was considered advisable to have each tug pull its own line so that if one carried away, the *DeLong* would still be in tow. The mooring lines would have to be let go early in the game, it was figured.

The sea showed no signs of moderating very much so plans for pulling the 10th of December were changed to the 11th of December.

On December 10 minor preparations were made and gear checked over to see that all was in readiness. It was intended to pull even with a moderate sea. A ten-inch manila line, 2,100 feet long, buoyed with gas drums and beer kegs was run from the tug to the *DeLong*. The end on the *DeLong* was passed around the after deck house and made fast there. The manila line was secured to a one-inch wire line on the towing engine on the tug.

At about 8:00 P. M. December 10, a heavy sea commenced running in, the *DeLong* rolling slightly under the strain. As time went on the sea kept getting rougher until about 11:00 P. M. when the tug with the ten-inch manila line reported that she had

parted her anchor chain and requested permission to slip her line. The tug with the one-inch wire line reported a rough sea with breakers alongside. Both vessels were ordered to slip their lines and to proceed to a point of safety. Before the one-inch wire line could be slipped, however, it carried away. The *DeLong* kept becoming more restless, so much so that her safety at high tide was feared for. It was then near low water. About four hours before high water "all hands" were ordered ashore.

During the high tide the vessel swung back and forth through about ten degrees. She was swinging on a point near the after boiler room as near as could be determined. In addition she was rolling slightly with each swing. Seas were breaking over the ship flooding the main deck as far forward as the galley deck house. The wooden houses around the pumps carried away. The after side of the after deck house was crushed so badly it was necessary to plank it, and shore it throughout.

Although the sea showed a tendency to moderate, all plans for moving the *DeLong* that date were canceled.

Sometime after high tide December 11, all hands returned aboard to straighten out the gear and to prepare for the next chance. Pumps were tried on the various compartments to see if the compartments had opened up any more but no signs of increased openings to the sea were found.

Arrangements were made for camping the entire crew ashore in tents made out of the ship's awnings. After December 11, the crew slept and took their meals ashore. The principal reason for having the crew ashore during high tide was that practically the entire after half of the *DeLong* was washed by seas, and further there was the danger of having the port mooring carry away, and then having the destroyer turn broadside to the beach and the seas, where pounding would soon have broken up the vessel.

Houses over the pumps were rebuilt of 2″ x 12″ stuff with 6″ x 6″ for framing and shoring. Fortunately this withstood all the seas after that. The canvas on the house over the forward engine room caught fire from the exhaust to the pump located there, but little damage was done before it had a chance to reach oil. (Oil seemed to be on everything from the engine rooms aft.)

On December 12, the sea had moderated considerably. During the morning high tide the *DeLong* rolled easily but she was ship-

ping seas as far forward as the galley deck house. Efforts were made by the salvage tug to pick up the one-inch wire line but it had fouled the rocks near the mooring anchor and could not be salvaged. The lead to the *DeLong* was cut clear so that there would be no danger of its fouling the *DeLong's* propellers. The ten-inch manila line was picked up by the navy tug with ease and she stood by riding as before. A seven-inch manila line, 1,900 feet long, was ordered to replace the one-inch wire line to be run from shore at daybreak the thirteenth. Preparations were made to pull the *DeLong* at 7:00 A. M. the thirteenth.

On December 13, a fog had set in so thick that the stern of the *DeLong* could not be seen from the bluff. Plans for pulling that morning were cancelled. The launch used for firing shot lines tried firing lines at daybreak, and owing to the fog had so much difficulty in seeing, that on two occasions the shots landed in the midst of the crew working on the bluff. By using a fog horn and a policeman's whistle for signalling, orders to await clear weather were sent to the launch and the tugs.

It was particularly desirable to commence pulling the vessel on the morning high tide since it was the highest tide; and further, because it was more desirable to move the ship during daylight when the lines could be seen to better advantage. However, so many things had intervened cancelling the movement on a morning tide, that it was decided that the vessel would be pulled morning or night provided lines were ready and sea moderate.

The ten-inch line to the tug had been out so long that its strength was questioned. Consequently it was tested by a pull at low tide and it parted about 600 feet from the *DeLong* where it had chafed on rocks. The two pieces were picked up immediately and arrangements were made for running it on the morning of December 14.

The low tides of this period permitted the rocks near the starboard quarter to be seen. A pinnacle was so near the vessel, and so nearly dead astern, that the only hope of clearing these rocks was to pull towards the North before the pull for deep water was commenced. Even then there was danger of the bow falling down on them.

On December 14 the ten-inch manila line to the tug was run satisfactorily. The pumps were started immediately after the

line was run but it was so near high water that advantage of that high tide could not be taken. It was decided, however, that the after compartments would be kept partly pumped to keep the seas from washing over the stern. Some of the shoring over the after deck house doors had been carried away, so it was necessary to again rebuild and resecure aft to keep the water from washing into the crew's compartment aft.

On December 15, at about 7:00 A. M., the seven-inch manila line was run to the salvage tug and all the pumps again started. The vessel had a list of about 5° to starboard to begin with but as the water was pumped out the list kept increasing. High tide was at 10:00 A. M. All lines ashore were cast adrift with the exception of the breeches buoy lines which were slackened only. The sea was moderate. As the water was pumped the *DeLong* kept listing to starboard until a 19° list was reached. The engine room pumps lost suction then leaving about six feet or seven feet of water in each of the engine rooms and nine in the forward boiler room. This meant that all suctions would have to be lowered to reduce the water to a point where the ship would commence to right herself. The danger in the list lay in that seas could easily break into the engine rooms through the hatches making it practically impossible for the pumps to handle that additional water. Efforts were made to lower the suctions but the oil and water in the compartments made it so difficult that is was impossible to get the work done on that tide. Further there were no signs of the list decreasing until the pumps were all stopped and water again taken in.

In view of the difficulty experienced it was decided that a five-inch gas pump be used on the after compartments, Section 5, leaving the steam pump to be used wherever it served best. In addition a "T" with gate valves on each suction with suctions to each of the fire rooms was placed in the line to the six-inch pump in the forward fire room. This was done to avoid handling the suction hose from one compartment to the other.

All of the night of December 15 and all day of the sixteenth were used in shifting suctions lower and nearer the center line. The troubles connected with handling six-inch and eight-inch suction hose in water and oil below the floor plates in fire rooms and engine rooms of a destroyer can only be known to one who

has experienced it. Floor plates, floors, and pipes are only a portion of obstructions.

The sea had increased on the sixteenth and at high tide the *DeLong* rolled and yawed considerably.

Compartments were inspected for additional damage caused by the list but no signs of increased injury could be found.

On December 17 high tide was due at 11:25 A. M. All preparations had been completed at 8:00 A. M. The two tugs were standing by with their lines. The weather was good and the sea smooth. The ship was rolling easily under the ground swells. At 8:30 A. M. all pumps throughout were started. As the water was pumped out strains were taken on the lines to the moorings—the hauling part of the port tackle was handled by the donkey engine ashore, the hauling part of the starboard tackle was handled by the ship's capstan. All pumps were working satisfactorily, the water in the ship dropping rapidly. At 10:00 A. M. the navy tug was ordered to pull to the north at an angle of about 30° with the fore and aft line of the *DeLong*. Strains were kept on the deck tackles. At 10:15 A. M. the *DeLong* moved off the beach, stern swinging to the north clear of the reef; no pounding of consequence was noted. The breeches buoy lines were cast off. Both tugs were ordered to pull. Gradually the vessel moved away from the shore. As soon as it was seen that all was going well the mooring lines were burnt off and cast clear. The tugs handled the *DeLong* well into safety.

When the *DeLong* went aground her rudder had been put hard to port. The rudder was seen to be about 25° to port when the vessel was inspected December 1 but since then the stern had been so deep in the water that the rudder could not be seen. Further the steering engine room had been full of water practically all the time so the rudder was still connected to the steam engine. It was planned that as soon as the steering engine room could be pumped dry steering would be done by hand. But in order to get underway without delay one tug was placed in tow of the *DeLong* with an eight-inch line for steerageway, while the other tug towed the *DeLong* with a ten-inch line. At about 10:30 A. M. the tow commenced. The pump in each section was run until it lost suction and then the compartment was allowed to fill until the pump could again pick up suction. At best about three feet

of water and oil remained in the lower compartments that the suctions could not reach. Soundings were taken at intervals and it was noted that practically all compartments below the berth deck were leaking. The forward compartments, however, were taking water slowly so no large pump was put on this section. The booster pump in the forward fire room kept the water in the forward oil tanks down.

After about an hour of towing the rudder hand gear was connected up and hand gear tried. The rudder seemed to move easily so the tug in tow of the *DeLong* was cast off. The *DeLong* was drawing about nine feet forward and twelve feet aft, giving her a decided trim by the stern. Large angles of helm were used to begin with but not until orders to use small degrees of rudder were given was it noted that she seemed to answer better with small helm. It is interesting to note that upon arrival at the navy yard, Mare Island, after having passed through all the channels satisfactorily the rudder was discovered to be missing, the stock only remaining.

The trip from Half Moon Bay to navy yard, Mare Island, was made without incidents, excepting the parting of the ten-inch manila line and substituting a wire tow line, at speeds varying from one knot per hour to six knots per hour. The vessel bucked an ebb tide practically continuously after entering the Golden Gate.

The *DeLong* arrived at Mare Island about 11:30 P. M., December 17, and was placed in dry-dock for examination immediately upon arrival. No information being available as to her damage the dock was prepared according to the regular docking plan.

A general survey of the bottom after the vessel was docked showed the following damage:

The rudder excepting a small section above the gudgeon was gone (very likely broken off during the heavy weather of December 10 and 11). The bottom was badly dented from bow to stern and leaked badly through leaky seams, butts, loose rivets, empty rivet holes. There was one dent in the keel about two frame spaces between the struts and the rudder post. In two places the keel was bowed up between bulkheads so that it was nearly a foot above the base line.

Weather reports from Half Moon Bay indicate that exceedingly bad weather set in the week following December 17.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE UNIVERSAL DRAFTING MACHINE AS A BATTLE APPROACH INSTRUMENT

LIEUTENANT COMMANDER D. T. HUNTER, U. S. NAVY

During the strenuous gunnery program of the Pacific fleet in the season of 1919-20, while the writer was on duty as navigator of the U. S. S. *Idaho,* approaches for the different forms of practice were a part of nearly every day's work.

Being dissatisfied with the various methods of using the mooring board for this problem, on account of the inaccuracy of the circles and graduations, it was decided to try the drafting machine with the ordinary cross-section paper supplied to ships, and the results were uniformly good.

No originality is claimed for the method, but conversations with other officers who have recently been navigators of battleships, developed the fact that none of them had ever seen this particular combination used, so it was thought that it might be of interest to others in the service.

The equipment used in the *Idaho* was very simple, consisting of an ordinary drawing-board, hinged to a batten which was lashed to some conduit pipes on the conning-tower wall, directly under the target-bearing indicator. The opposite edge of the board was fitted with a single hinged leg, so that the board, when not in use, hung vertically against the wall. A spare drafting machine anchor, secured permanently in the upper left-hand corner of the board, a camp-stool and a rack for pencils, dividers, and stop-watch completed the outfit.

A sheet of cross-section paper, cut from a large roll, covered the whole board, and the long rulers supplied with the drafting machine were graduated to the same scale (inches and tenths) as the cross-section paper. The advantage of the cross-section

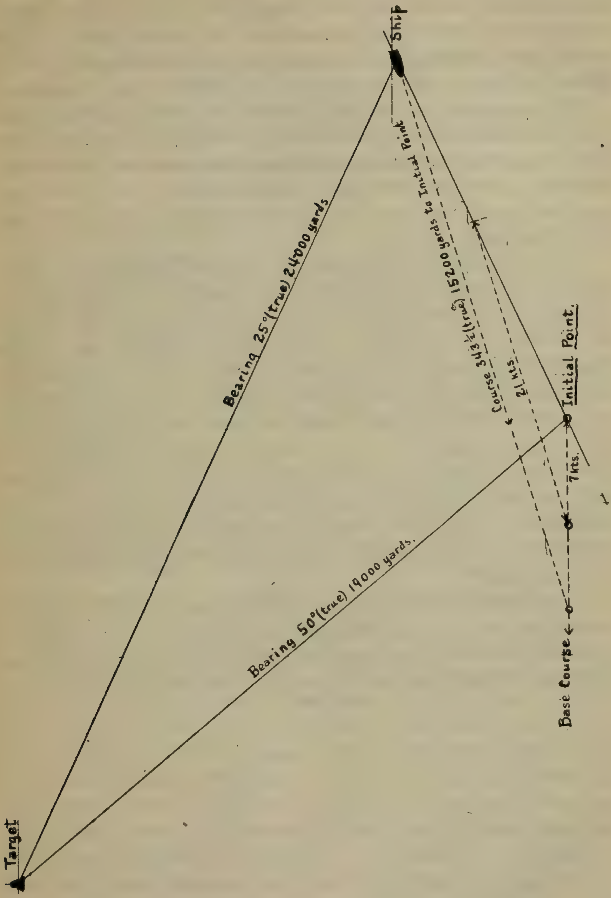
paper and similarly graduated ruler is the great variety of comparatively large scales which is available for any approach problem. It was the writer's practice to use a scale of 1″= 200 yards for S. R. B. P., 1″= 500 yards for S. R. D. P., and 1″= 1,000 or 2,000 yards for the longer range practices.

The target was represented by a pin driven into the board near the middle of the upper edge, through the intersection of two of the heavy lines of the paper, to facilitate alignment of the ruler while plotting. It is also advisable to plot the towing vessel at the proper distance ahead of the target, for use in case the latter should be temporarily obscured.

The heavy horizontal line, containing the pin, was always taken as the base course of the target and if the practice involved firing on both sides the course was reversed by simply reversing the compass rose of the drafting machine. The required track of the ship for the practice, and all important bearings and points were plotted on the sheet in red ink and prominently labelled.

The operation of plotting involved no new principles, but for the sake of clearness as to the use of the gear it will be described briefly. The ship's course and the bearing of the target are obtained from the target-bearing indicator, and the range from a J. W. talker stationed beside the chart board, so that the ship's position at any instant can easily be plotted by distance and bearing. The method of reaching the initial point may best be illustrated by an example. Suppose it is desired to reach an initial point from which the target will bear 50° to the right of the base course, distant 19,000 yards; base course North (true); target speed 7 knots; ship's speed 21 knots; and that the target now bears 25° (true), distant 24,000 yards.

First orient the drafting machine, plot ship's position and draw a line connecting it to the initial point. Consider the initial point to move forward on the base course at the target's speed and lay off from that point, to any convenient scale, a distance representing 7 knots, in the direction of the base course. With the end of this line as a center and a radius equal to 21 knots (to the same speed-scale) strike an arc to intersect the line joining ship's position and initial point. Press the points of the dividers into the board, lay the drafting-machine ruler against them and clamp the machine. This gives the course to steer (343-1/2°


Ship
Bearing 25°(true) 24000 yards
Course 343½°(true) 15200 yards to Initial Point
21 kts.
Initial Point.
7 kts.
Bearing 50°(true) 19000 yards.
Base Course
Target

true). Leaving the ruler clamped, lay it through the ship's position and measure the distance to the point where it intersects the horizontal line through the initial point. This is the distance which must actually be run to reach the initial point (15,200 yards) and, dividing by the ship's speed (700 yards per minute) gives the time it will take to cover that distance (21.7 minutes).

The stop-watch may be started when the plotting begins, so that the time consumed in plotting and changing course will not affect the result, but practice will so reduce this time that this is, perhaps, a needless refinement at long ranges. The course and position should, however, be checked repeatedly before reaching the initial point.

At the shorter range practices it is often important to know the ship's advance and transfer for changes of course of less than 90° and a table of advances, transfers and times for changes of course of 15°, 30°, 45°, is very useful. In the case of the *Idaho*, it was found, during rehearsals of S. R. B. P., that putting the rudder over 15° one way and meeting with 15° of the opposite rudder when the ship began to swing, would bring the ship on a line fifty yards in or out from the target. This will vary for different ships, but a table may be constructed on this principle, to bring the ship any desired distance in or out. Any maneuver of this kind must, of course, be performed before "whistle" if friendly relations with the gunnery department would be maintained.

All navigators have their pet methods and "gadgets" for this sort of problem, but, unfortunately navigators do not get together and compare ideas as gunnery and engineer officers do, and it was with this in view that this article was submitted.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AIDS TO ACCURACY IN BATTLESHIP MANEUVERS

By Commander Russell Willson, U. S. Navy

In maneuvers involving a change from one of the standard battleship formations to another such formation, without change of fleet course, the speeds and courses of maneuvering units may be prescribed and illustrated quite definitely in standard instructions. In maneuvers involving other changes of bearing, with or without change of fleet course, the evolutions of maneuvering units cannot be so definitely prescribed and illustrated, and each maneuver of the battle line presents a separate problem to the unit commanders.

Existing instructions for such maneuvers, whether in cruising or battle formations, do not include many convenient "aids to accuracy" for the commanders of the maneuvering units. In this article some simple rules are given based largely on two Course Angle Cards and a Data Card, which have been found both rapid and accurate, in determining the proper evolutions to accomplish prescribed changes of position.

Developments since the recent war in some ways have permitted a simplification in the rules by which such maneuvers may be executed. Pre-dreadnoughts have been dropped from our battle line. As a result we have a battle line of battleships homogenous as regards speed. "Flank speed" (one quarter more than standard) and the most complicated one of the cruising formations, may therefore be considered eliminated. The submarine has forced acceptance of the rule—"No evolutions at appreciably less than standard speed." A "leeway" of three knots is allowed to facilitate station keeping, and two-thirds speed is permitted for base units under certain conditions (the assumed absence of enemy submarines), but in general it may be said that the com-

mander of a maneuvering unit, during battle line maneuvers, is troubled but little by the question—"what speed?"

Normally, if a maneuver requires that a unit advance its bearing, it takes full speed, otherwise it uses standard speed. Should the maneuver involve a considerable change in interval, standard speed may be indicated when the bearing is to advance or full speed when the bearing is to drop back. However, when once in formation such occasions are unusual. The important question for the unit commander is—what course and when?—and it is here that aids to accuracy are valuable.

The Course Indicator and Mooring and Maneuvering Board (H. O. 2665) are the best "aids to accuracy" now available. Unfortunately, it cannot be said that all officers are familiar with them. But it can be said, and truthfully, that someone on the flagship of the best handled division is familiar with both. It may be added that someone on the flagship of the worst handled division is probably unduly familiar with the "seaman's eye" method.

The Course Angle Cards and Data Cards described in the following pages are not set forth as something to replace the Maneuvering Board and Course Indicator—they are merely useful diagrams constructed to furnish in convienient form the solution of the course problems common in battleship maneuvers. In this limited field they have been found more rapid than either the Course Indicator or ordinary use of the Mooring Board; they tell when to turn as well as how much to turn, and in the so-called "two course evolutions" give data not readily obtained otherwise.

There are two Course Angle Cards:

The Full Speed Course Angle Card (Fig. 1).
The Standard Speed Course Angle Card (Fig. 2).

These cards are described as diagrams etched on transparent celluloid. For trial, however, they could be printed on tough transparent paper.

The diagrams are constructed for battleships with the best turning and speed variation data available in the Navy Department. They have the advantage that each diagram may be modified to allow for the special tactical qualities of any ship.

In addition, there is a Data Card (Fig. 3), which may be printed in any convenient form and kept posted on the bridge.

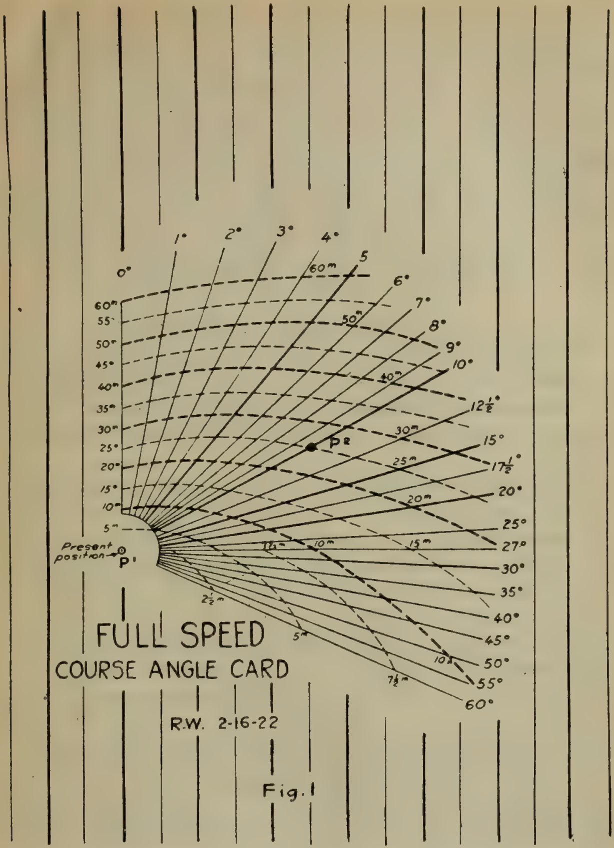


Fig. 1

In this description the *base course* is the course of the guide, assuming that the guide maintains a steady course during the maneuver.

The *course angle* as used in this article is the angle between the base course and the course of the unit maneuvering to attain a new position.

One course evolutions are those in which the direct course to the new position requires a course angle of not more than 90 degrees and there is sufficient sea room to make the required turns.

Two course evolutions are those in which a direct course to the new position would require a course angle of more than 90 degrees or else there is not sufficient sea room to perform what otherwise would be a one course maneuver. In such cases it is necessary to use two course angles: (1) a course angle of not more than 90 degrees to reach an intermediate position, and (2) a course angle of not more than 90 degrees by which it is possible to proceed directly from the intermediate to the new position.

FULL SPEED COURSE ANGLE CARD

The Full Speed Course Angle Card, used in connection with the Mooring and Maneuvering Board (H. O. 2665) gives (1) the correct change of course, and (2) the time required for the maneuver, when using full speed to accomplish a change of position.

In its most convenient form the Full Speed Course Angle Card consists of the diagram shown in Fig. 1, etched on both sides of a rectangular piece of transparent celluloid in such a manner that when the card is turned over the diagram, as shown in Fig. 1, will appear reversed—that is, with the "present position" point at the right of the diagram.

It will be seen from the figure that the diagram consists of (1) a series of radial lines forming a scale covering about one-third of the arc of a circle, (2) parallel vertical lines covering the space outside of the radial lines, and (3) a series of dotted lines connecting corresponding time points on the radial lines.

The radial lines are marked in degrees at the outer end, the scale running by unequal increments from 0 degree to 60 degrees. The dotted lines are "time" lines, marked in minutes of time, for a standard speed of 15 knots.

To obtain the correct change of course (course angle):

(1) If using true bearings, indicate the course of the guide by a line from the center of the Mooring Board. If using relative bearings, call the zero line of the Mooring Board the course of the guide.

(2) Plot on the Mooring Board the "present position" and the "new position" assuming the guide at the center of the diagram, and using the one-inch squares on the board as 1,000 yards.

(3) Place the "present position" point of the card over the "present position" (P^1) as plotted on the Mooring Board. Adjust the card so the parallel lines are parallel to the course of the guide, as indicated on the Mooring Board. (If using relative bearings, the parallel lines will be vertical.)

(4) The plotted "new position" will fall on or near one of the radial lines, say at P^2. The number at the end of this radial line is the number of degrees necessary to change course to proceed directly to the new position, in this case 10 degrees.

The time required to reach the new position may be desired (a) to check the plotting during the maneuver, (b) as a substitute for plotting when plots are not reliable, (c) by the battleship commander to determine how long a given or proposed maneuver will require.

To obtain the time required to complete the maneuver:

Having placed the card as above described in obtaining the course angle, the position of the plotted "new" position P^2 relative to the dotted "time lines" gives the time required to reach the new position if the standard speed is 15 knots (full speed 16-7/8 knots). This time for a *standard* speed of 15 knots is readily converted into the time for any other *standard* speed from 12 to 20 knots, by means of the Data Card, Fig. 3. The times given are based on the usual scale of the Mooring Board, 1″= 1,000 yards. If a different scale is used in plotting the positions the time required will vary inversely with the size of the scale.

The figure shows that to reach position P^2 from P^1 would take twenty-five minutes using full speed based on a standard speed of 15 knots. If standard speed were 18 knots the time required would be about twenty and five-sixths minutes.

It has been said that the above form of the Course Angle Card is most convenient. However, if found satisfactory to work entirely on relative bearing, the full diagram of the full speed course angle card (omitting the parallel lines) could be printed in red on, and concentric with the Mooring Board diagram. In this case the parallel rulers would be placed on the present and new positions, then moved to the center of the diagram, and the intersections of the rulers on the course angle scale would give the correct angle. The time would be obtained by drawing this

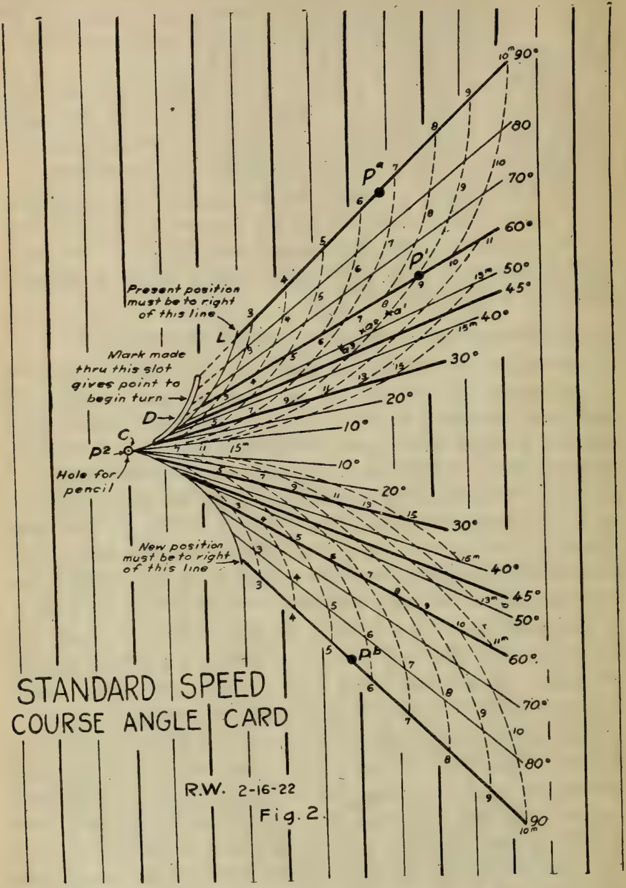

Present position must be to right of this line
Mark made thru this slot gives point to begin turn
Hole for pencil
New position must be to right of this line
STANDARD SPEED COURSE ANGLE CARD
R.W. 2-16-22

Fig. 2.

line, and measuring on this line a distance from the center equal in length to the line joining the present and new positions.

STANDARD SPEED COURSE ANGLE CARD

The Standard Speed Course Angle Card is useful in both one course and two course standard speed evolutions.

ONE-COURSE EVOLUTIONS

In one-course evolutions it gives:

(1) The correct change of course (course angle) for proceeding directly from present position to new position using standard speed.

(2) If working on time—
- (a) The correct time for beginning the turn back to the base course, reckoned from the beginning of the first turn.
- (b) The time required to complete the maneuver.

(3) If plotting—
- (a) The point at which to begin the final turn, if on the correct plotting line.
- (b) The change of course required, in case the plots "run off" the correct plotting line.
- (c) In conjunction with the data card, the change of speed which may be used in place of a small change of course, in case the plots "run off" the correct plotting line.

The Standard Speed Course Angle Card consists of the diagram shown in Fig. 2, etched on both sides of a rectangular piece of transparent celluloid, in such a manner that when the card is turned over the diagram as shown in Fig. 2 will appear reversed—that is, with the point "C" at the right of the diagram.

The vertical parallel lines are similar to those of the Full Speed Card.

"C" is a small hole and "D" a curved slot through which a pencil point can make a mark on the Mooring Board diagram.

The solid lines radiating from "C" are marked in degrees at their outer ends.

The dotted lines are "time" lines connecting corresponding time points on the radial lines. They are marked in minutes, for a standard speed of 15 knots.

The solid curved line "LC" indicates the minimum limits within which it is not practicable to perform the change of course indicated.

In one-course maneuvers, only the upper half of the diagram is used.

To find the correct change of course (course angle) for a one-course evolution:

(1) Plot the present and new positions on the Mooring Board (H. O. 2665) assuming the guide as at the center of the Mooring Board, and using the usual scale of 1″ equals 1,000 yards; and indicate the course of the guide if using true bearings.

(2) Place "C" over the *new* position (P^2) using that side of the card which puts the radial lines of the diagram over the present position.

(3) Turn the card so that the parallel lines are parallel to the course of the guide as indicated on the Mooring Board (if using relative bearings course of guide will be zero, and these lines will be vertical).

(4) The present position (P^1) will fall on or near one of the lines radiating from "C". The number at the end of this line, interpolating if necessary, indicates the correct course angle. For positions P^1 and P^2 this would be 60°.

To find the correct time for beginning the turn back to the base course, reckoned from the beginning of the first turn:

Having placed the card for finding the course angle, the location of the present position relative to the dotted lines of the time scale gives the correct time at which to begin the turn back to the base course; for (P^1) this would be nine minutes. This time is for 15 knots, and for other speeds should be converted using the Data Card, Fig. 3. If standard speed is 18 knots the correct time would be about seven and one-half minutes.

To find the time required to complete the maneuver:

The time required to complete the maneuver is the "time to begin the turn" as found above, plus the time required in making

the final turn. For positions shown, at 15 knots the total time would be nine minutes plus two minutes, or eleven minutes, which at 12 knots would be thirteen and three-fourths minutes.

To find the point at which to begin the final turn, if on the correct plotting line:

Connect the present and new positions with a line drawn on the Mooring Board diagram. Successive plots should closely follow this line in approaching P^2, with the course angle given by the card. With the card in position as explained for finding the course angle, draw a curved line by running the pencil through slot D." The intersection of this line on the plotting line is the correct point to begin the turn.

To find the change of course required in case the plots "run off" the correct line:

Suppose that while using a course angle of 60° to approach P^2 from P^1, successive plots a^1, a^2, a^3 are obtained. As a^3 falls on the 50° line of the diagram, the correct course angle from that position is 50° instead of 60°. The proper change, therefore, is "ships right 10."

To find the change of speed which may be used in place of a small change of course, in case the plots "run off" the line:

Find the corrected course angle as explained in the previous paragraph, and consult the table of the Data Card. In the example given the ship was using standard speed and a course angle of 60°, whereas, if she maintained standard speed she should have changed to a course angle of 50°. The table of the Data Card shows that for a course angle of 60°, an increase of 2 knots corresponds to a change of course angle to 50°.

TWO-COURSE MANEUVERS

In two-course standard speed maneuvers, the Standard Speed Course Angle Card gives:

(1) The best combination of two-course angles to be used in reaching the new position, and the location of the correct "intermediate position" for that combination of course angles.

(2) If working on time—

(a) The correct time for beginning the second turn, reckoned from the beginning of the first turn.

(b) The correct time for beginning the final turn, reckoned from the beginning of the turn from the base course while in the intermediate position "C."

(c) The total time to perform the evolution.

(3) If plotting—

(a) The point at which to begin the second turn, when nearing the intermediate position.

(b) The point at which to begin the final turn on nearing the new position.

(c) The change of course required in case the plots "run off" the correct plotting line.

(d) In conjunction with the Data Card, the change of speed which may be used in place of a small change of course, in case the plots "run off" the correct plotting line.

In two-course maneuvers the whole diagram is used.

To find the best combination of two course angles:

(1) Plot the present and new positions on the Mooring Board, assuming the guide at the center of the Mooring Board, and indicate on the board the course of the guide (if using relative bearings course of guide is taken as zero).

(2) Use that side of the card which gives the first turn away from the guide if abeam or forward of beam of guide, or toward the guide if abaft the beam of the guide.

(3) Place the Course Angle Card over the Mooring Board with the present position P^a on that one of the upper lines, and the new position P^b on that one of the lower lines, which between them form the largest angle at "C." While doing this keep the parallel lines parallel to the course of the guide (if using relative bearings, these lines will be vertical).

(4) The numbers of degrees marked at the end of the radial lines on which the plotted positions fall, give course angles which, if used, will accomplish the required maneuver in the least possible time. For positions P^a and P^b as shown in the diagram the first course angle is 90° and the second course angle is 90°.

To find the correct time at which to begin the second turn and the final turn:

With the card in position for finding the course angles, the present position P^a on the upper 90° line falls at 6-1/2 on the time scale; this indicates that the second turn should be begun six and one-half minutes after beginning the first turn, and that when the ship has resumed the course of the guide, its plotted position will be at "C."

Similarly, the new position P^b falls at 5-1/2 in the lower 90° line. This indicates that the final turn should be begun five and one-half minutes after beginning the turn from the base course, while at the intermediate position "C."

To find the total time for the maneuver:

Add the time indicated on the upper line, the time indicated on the lower line, the time to turn through the first course angle and the time to turn through the second course angle. In the example given, the total time would be 6-1/2+5-1/2+2-1/2+2-1/2=17 minutes at 15 knots. This may be covered for other speeds by the Data Card.

In the above example the course angles found were those required to perform the maneuver in approximately the shortest time. It may happen in the case of units whose evolutions do not determine the total time for completing the change of formation, that it is preferable to avoid radical changes of course when near the new position, even at the expense of a little time. By moving the card, while keeping the parallel lines parallel to the course of the guide, any number of combinations of course angles, with the time required for each combination, may be obtained.

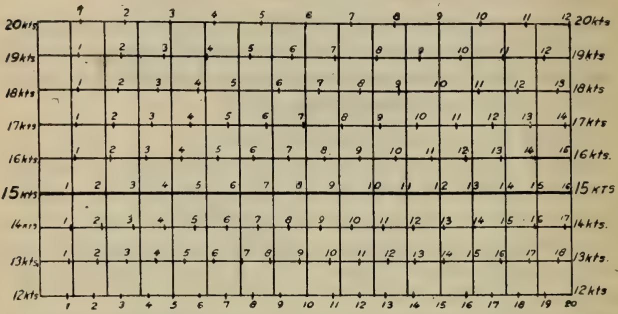
Use of the card when plotting in two-course maneuvers:

The upper half of the diagram of the card is used in plotting in the two-course maneuvers in the same manner as in one-course maneuvers. In plotting the approach to the intermediate position "C," the card is kept in the position for obtaining the course angle. To plot the approach from the intermediate position "C" to the final position, it is necessary only to turn the card over, and use the upper part of the diagram just as if the maneuver were merely a change from the intermediate to the final position.

Data Card

The Data Card is merely a printed card which contains data for use in connection with the course angle cards. It may be posted on the bridge, or merely kept at hand while using the course angle cards. It is shown in Fig. 3, and is largely self-explanatory.

DATA CARD



Scale for converting times at 15 kts to times at other speeds

Present Course Angle	Standard Speed Course Angles to which Small Changes of Speed are Equivalent				
	3 kts less than Stand	2 kts less than Stand	1 kt less than Stand	1 kt more than Stand	2 kts more than Stand
90°	100°	97°	93°	87°	85°
80°	92°	88°	84°	76°	73°
70°	85°	80°	75°	66°	62°
60°	78°	72°	66°	55°	50°
50°	72°	64°	57°	44°	38°
45°	68°	60°	52°	39°	32°
40°	65°	56°	48°	33°	26°
30°		53°	41°	21°	

Table for adjusting approach to new position by change of speed

Times for turns at 15 knots	
Turn	Time
90°	2m 30s
80°	2m 20s
70°	2m 10s
60°	2m
50°	1m 50s
45°	1m 45s
40°	1m 40s
30°	1m 30s
20°	1m 10s
10°	0m 50s

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Fig. 3

The time scale is given for times up to sixteen minutes, but may be used for longer intervals of time. Thus to convert twenty-four minutes at 15 knots, to time at 20 knots; the scale shows twelve minutes at 15 knots, corresponds to nine minutes at 20 knots—therefore, twenty-four minutes at 15 knots corresponds to eighteen minutes at 20 knots.

The table for small changes of speed is based on a standard speed of 15 knots, and some allowance is made for delay in ships picking up or losing speed. It is, therefore, only approximate. The table giving the time to make various turns is approximate, and would of course be more accurately obtained on each ship.

CONSTRUCTION OF COURSE ANGLE DIAGRAMS

Having described the use of the Course Angle Cards, it may be of interest to examine the method of constructing the diagrams.

The construction of the Full Speed Card is comparatively simple. The several radial lines of the diagrams are merely the lines of plotted relative positions which result from a ship at the center (marked "present position") taking full speed and changing course the angle marked at the outer end of each line. The dotted time lines are obtained by plotting on the mooring board. Allowance is made for time required for ships to pick up speed.

The construction of the standard speed card is somewhat more complicated.

If a ship turned instantaneously and without loss of speed, the following rule would govern:

"If a ship in formation change course any angle, maintaining the same speed as the guide, the plotted positions of that ship, relative to the guide, will follow a straight line whose inclination to the "beam line" of the guide is one-half the change of course."

This rule may be checked by the Mooring Board or proved mathematically.

Referring to Fig. 4—if a ship at any position, say "P," with same course and speed as the guide, changed course instantaneously 90° to the right without loss of speed, its successive positions relative to the guide would plot along the line "PX," the

angle "XPK" being half of 90°, or 45°. Similarly, if the change of course were 60°, the successive relative positions would plot along the line "PY," the angle "YPK" being half of 60°, or 30°. This is the basis for the construction of the lower half of the standard speed card.

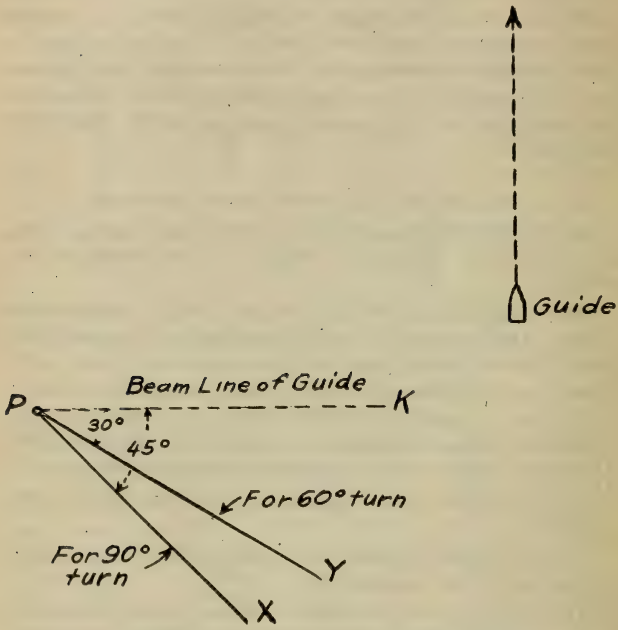

Fig. 4.
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Now considering Fig. 5—If it is desired to reach a new position relative to the guide, say at P^2, using standard speed and a course angle of 90° away from the guide, it is apparent that the present position of the ship must be somewhere on the line PP^2, which makes an angle of 45° with beam line of the guide

BP^2. If the course angle were to be 60°, the present position would have to be on the line QP^2 (angle QP^2B being 30°). If the course angle were to be 30°, the position would have to be on the line RP^2 (angle RP^2B being 15°). This is the basis for the construction of the upper half of the standard speed card.

But ships do not turn instantaneously, and they do suffer a temporary loss of speed as the result of a turn. We will examine the extreme case of a 90° turn, it being understood that

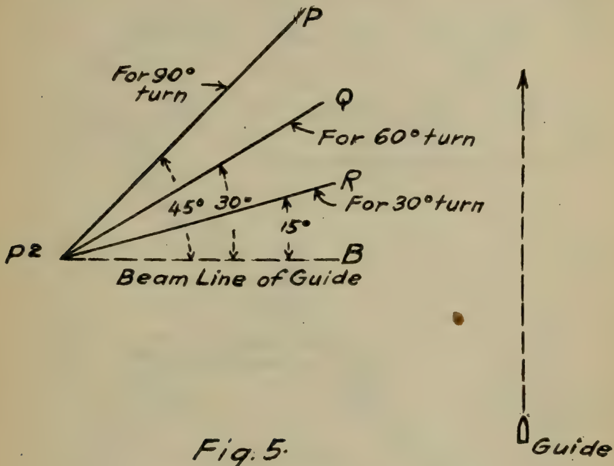

Fig. 5.

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the same process has been followed in the construction of the diagram for other angles of turn.

Fig. 6 shows the tracks and plotted relative positions of an actual ship and an "instantaneous turn" ship, which, from a position P^1, make a turn of 90° left, and later a turn of 90° right with a view of attaining a new relative position P^2. The dotted line represents the actual ship, the solid line the "instantaneous ship." The figure shows that when the ship turns 90° (with tactical diameter of 1,000 yards) its plotted positions at the end of

each turn (points 2½ and 14) are ahead of the 45° plotting line P^1P^2. But at the end of a 90° turn a battleship has lost about thirty per cent of its speed. This shows in the figure between points 2-1/2 and 4-1/2 when the dotted line drops back toward the 45° line; also between points 14 and 16. On completion of the

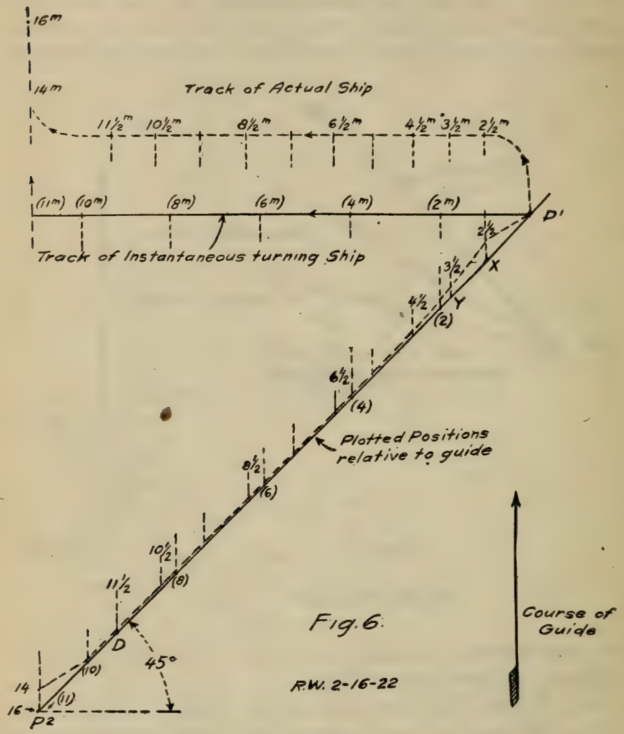

Fig. 6.

second 90° turn the relative position of the actual ship plots at 14, but before the ship regains its speed, the plot of the relative position will drop back to point 16. In other words, the extremities of the line of plotted positions for the actual ship approximately coincide with those of the "instantaneous" ship,

and the rule of halving the angle of change of course may be used for the diagram of the course angle card. However, the "time points" do not coincide, and any time scale for the course angle card must be based on the time intervals of the actual ship as found by plotting.

Now for the purposes of the course angle card, it is desirable to know—not so much where the ship's position will plot at a certain time—as how long after starting the first turn, the second turn should be begun. Suppose we reproduce the solid line P^2DP^1 of Fig. 6, as Fig. 7. In order for the ship to reach position P^2 it must begin the *second* turn when at position "D." In order to complete the *first* 90° turn before reaching "D," the "present" position must be as far from point "D" as the plotted position will move toward "D" while the ship is making the first 90° turn. This distance is "DL" (Fig. 7) which is equal to P^1X of Fig. 6. But it takes two and one-half minutes to turn 90°,

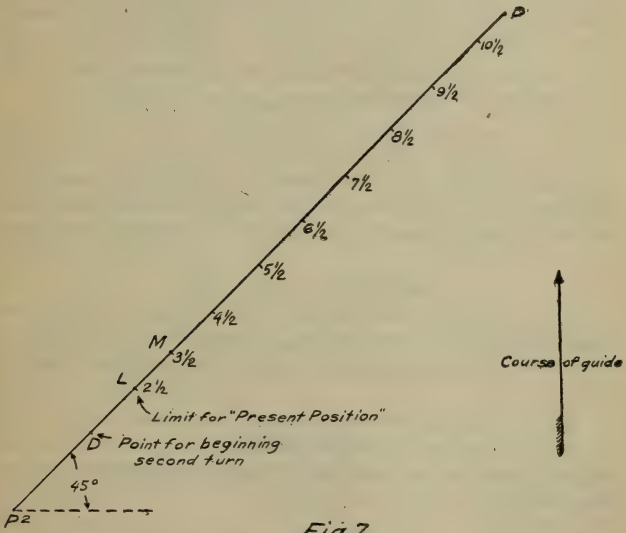

Fig. 7
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therefore point "L" is the two and one-half minute point on the scale we are constructing. In other words if a ship at "L" turn 90° to the left, and at two and one-half minutes later (on completing the turn) begins a 90° turn to the right, the ship will reach position P^2 when it has picked up its speed and is on the course of the guide. It will be seen that "L" marks the position nearest P^2 from which this maneuver can be performed.

Now Fig. 6 shows that in three and one-half minutes from beginning the first turn, the plotted position moves a distance which projects on line P^1P^2, as P^1Y. Therefore, the three and one-half minute point on our scale in Fig. 7 must be at "M," where P^2M (Fig. 7) equals P^1Y (Fig. 6). Obtaining other points in the same way, we have the scale as shown in Fig. 7. This scale marked in whole minutes, is the scale of both the upper and lower halves of the standard speed course angle card.

MANEUVERING RULES

Having at hand the Cards described in the previous paragraphs, the following rules may be stated as summarizing their uses as "aids to accuracy" for commanders of maneuvering units.

EVOLUTIONS AT FULL SPEED

Course—Change course toward new position, the angle obtained from Full Speed Course Angle Card. For changes of less than 10° use column movement, otherwise simultaneous movement.

When to turn—If working on time begin second turn so as to complete the turn at time indicated on course angle card. If plotting, begin second turn when plotted position approaches new position.

Time to perform evolution: Obtain time from full speed card.

EVOLUTIONS AT STANDARD SPEED

Whether a one-course or two-course evolutions, and the appropriate course angle or angles.

The Course Angle Card gives this information. For the convenience of unit commanders in making signals for the first turn, it can be placed in tabular form.

Direction of First Turn

If present position is—

(a) Forward of guide's beam, first turn is "out."

(b) Abeam of guide, first turn is "out," except in forming column, when it is "in."

(c) Abaft beam of guide first turn is "in."

When and Where to Execute Turns

(a) If working on "time," execute turns at time indicated by Course Angle Card.

(b) If plotting, execute turns when plotted distance to new (or intermediate) position is that indicated by the Course Angle Card, as correct for that course angle.

To Adjust Inaccuracies in Approach to a Position

If good "plots" are obtained and consistently "run off" the line between the present and new (or intermediate) positions, some adjustment is necessary. Any plotted position may be taken as a "present position" and the course angle from that position to the new position determined by the Course Angle Card. Having the new course angle, the adjustment by change of speed is given by the Data Card.

Time to Perform Evolution

Add the times at which to begin the turns, as obtained from Course Angle Card, and the time required to make the turns as given by the Data Card.

GENERAL RULES

1. Use the best available mechanical or diagrammatic means of telling how much and when to turn. Do not use the seaman's eye.

2. Turn too soon rather than too late.

3. While maneuvering, keep ahead rather than behind your line of plotted correct positions.

4. Use both plotting method and time method whenever possible, checking each with the other.

DISCUSSION

A Fighting Leader for the Fleet

(See Page 561, Whole No. 230)

Captain J. K. Taussig, U. S. Navy.—When my paper on "An Administrative Flagship for the United States Fleet" was written, I had not seen Lieutenant Commander Turner's article on "A Fighting Leader for the Fleet," published in the April Proceedings. I am sorry for this, as it would have then given me the opportunity to refute some of the statements and arguments which Mr. Turner advances in his discussion.

It seems to me that throughout Mr. Turner's paper, while he is dealing with very big things, all his arguments are based on smaller things, that is, much smaller than the present-day conditions warrant. His conclusions seem first to have been reached, and the arguments to justify these conclusions made afterwards.

Early in his paper are the following statements:

1. The tradition of the sea is the fighting leader commanding the fleet from a fighting ship and exercising a personal control whether of strategical operations or tactical movements in battle that has in the case of shore forces been delegated to subordinates by the general in command.

2. Successful war at sea has in the past been waged by seamen with seamen's methods; in the future seamanlike methods will gain like results. And in referring to Staff methods:

3. Not content with the British system, since, in the only sea battle of first importance, it (or something) failed to produce satisfactory results even with overwhelming forces, we attempt to adapt the devices of the soldier to the solution of the problems of the sailor.

It is evident from the above quotations that the author is appealing to something very indefinite in the sea atmosphere as an argument against profiting by the lessons learned by land forces. The truth of the matter is, we in the navy have a great deal to learn from the army in regard to organization. This is because the army has been used for many years to deal with numbers, while it is only in recent years that the navy has grown to respectable size.

It was not so very many years ago when the army followed the tradition of always having the commander-in-chief at the front, leading his troops into battle. When armies got too big for this they stopped that foolishness and put the leader where he could best control; which was not a place where he would likely be the first man killed. Now that our fleet has reached a size where it is impossible for the commander-in-chief to personally control the individual ships, we had better profit by the lessons to be learned from the army.

It is true "successful war at sea has in the past been waged with seamen's methods." But let us not forget that the seamen of today are very different from the seamen of the past. And what is of still more importance let us keep in mind that with the change in character of ships, and size of fleets, that seamen's methods have very materially changed. We must advance our organization and administration in keeping with the advancement in seamen's methods.

In referring to the British at Jutland he speaks of the failure of the staff system ("or something") as the cause of unsatisfactory results. It was not the fault of the British staff system. The "something" which prevented a British victory on that day was twofold. One was the defensive tactics employed, and the other was the lack of co-ordination and co-operation of the forces of the British fleet due to the fact that the commander-in-chief was in immediate command of the battleship. The lesson learned in this battle (the only one ever fought where fleets on a large scale were engaged) surely should take precedence over the traditions and experiences of the past wherein only comparatively small forces composed the fleets.

We must advance in organization as well as in other matters. And the proper organization of a modern fleet calls for the commander-in-chief to be separated from the immediate command of any one of the forces that compose that fleet. If we do not do this the next *great* sea fight will be another Jutland. The various forces will not be properly co-ordinated, and effective co-operation will be impracticable.

To carry out the argument that the commander-in-chief must take immediate command of the battleships because they exert the most fighting power, we might as well argue that the captain of a battleship should take immediate charge of the turrets of the ship, and the President of the United States should take immediate charge of the war and navy departments.

There can be no objection to the commander-in-chief being on a fighting ship, and in the absence of battle cruisers it may be that a battleship is a better place for him than a scout cruiser or some other type of ship. But whatever kind of ship he is on, he must not be in immediate command of the battleships nor must he of necessity be physically attached to them. This would cramp his style entirely too much. He must be free to take whatever position he pleases.

The position he would take would not necessarily be *back* of the fighting line. It might be in the fighting line; in advance or in the rear of the fighting line, within gun range; or it might be entirely out of gun range on one of the flanks. It will be that position which will enable him best to learn through communications, his own observations, and the observations of his staff reduced to a plotting board, what is actually going on.

Mr. Turner states: "The battleship force is the fleet; . . ." This statement is so far from fact, so misleading to the layman, that it must not be allowed to pass unnoticed. It is just such statements as this that have prevented us from obtaining a balanced fleet. It is this stand taken

by some officers that has resulted in our not having any battle cruisers, few light cruisers, and no destroyer leaders. It is the stand which prevented an adequate number of destroyers until the submarine forced them on us. It is this stand that is now preventing a proper development of air craft.

The fleet is not any one of the elements that compose it. While the battleships are the backbone of the fleet, still there should not be any such thing as a battleship force in a modern up-to-date organization. This is recognized by the Navy Department. After making a thorough study of the Battle of Jutland, and a careful estimate of the situation as it at present relates to our sea-going forces, an organization of the United States Fleet has been adopted. There is no battleship force in this organization. Instead there are the battle force, scout force, base force, control force. Each of these forces is composed of a combination of different kinds of ships in accord with their war time functions. *It is these forces in toto which are the fleet.* And for their proper administration and command there should be a ship, independent of all these forces, on which the commander-in-chief should be stationed. There is too much for the commander-in-chief to do with respect to the entire fleet, to saddle him with the immediate command of one of its parts.

Mr. Turner states that "The battleship force should be handled as frequently as possible—every time it gets underway as a force—by the man who is to handle it in action." Granting that by "battleship force" he means the battleships in the firing line, it is a perfectly logical statement. But why should the commander-in-chief have to do this? Have we not other flag officers capable of commanding battleships and who of course would habitually command them before and during battle, in fact every time they get underway? Are we not far enough advanced for the commander-in-chief to trust and rely on the commander of the battleships just as he trusts and relies on the commanders of the cruisers, the destroyers, the submarines? The argument Mr. Turner makes about the Battle of Jutland disproves all his own statements. He says in speaking of the British: "Success eluded them not because of defective ships, faulty organization, poor gunnery, or lack of information, but because of ineffectual handling of the battleships."

Faulty organization and lack of accurate information certainly did have something to do with the lack of British success. But both of these were intimately connected with the chief cause of failure, that is "the ineffectual handling of the battleships." The battleships were ineffectually handled partly because the commander-in-chief who had his hands more than full in the endeavor to co-ordinate the large number of elements of the fleet, was also attempting to take immediate command of the battleships. The lack of co-ordination between the various forces that composed the British fleet is what caused the failure of the British to beat the Germans. Their co-ordination and co-operation was lacking because the British commander-in-chief was so intimately connected with the battleships that his chief duty was neglected.

Mr. Turner's closing sentence is: "The fleet must, in peace or in war, be directed by a fighting leader in a fighting ship." He is undoubtedly right about the statement that the fleet must at all times be directed by a fighting leader. That it would be desirable for him to be on a fighting ship at all times is not necessarily so. Not unless the fighting ship is such that his other functions such as planning, and administering can be carried out to better advantage, than on some other class of ship. Certainly this can not be done now.

We must remember that tactics are only the culmination of organization, administration, planning, strategy, and logistics. Certainly due consideration must be given to all these things. We must not limit ourselves to only the tactical viewpoint.

In regard to the "two flagship" system, this, of course, is a makeshift because there is no suitable ship extant for service as both an administrative ship and a tactical ship. It would be wise if we built such a ship. It would be worth more to us than any single unit which the limitation of armament agreement permits us to build. But there is no immediate chance of this. In the mean time it is far better for us to go half way right by having both an administrative flagship and a tactical flagship, than it is to stay all the way wrong by not having either.

To tie down the commander-in-chief to one of the elements of his command is wrong in theory, it is wrong in principle, and in the only really great modern battle, it has been proved to be wrong in practice.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SECRETARY'S NOTES

Membership Life, regular and associate, 4820. New members, 6. Resignations 1. Deaths, 2: Lieutenant H. A. Christensen, U. S. M. C., Commander A. L. Norton, U. S. N.

Practically the whole service receives the benefit of the PROCEEDINGS, yet many officers who read it monthly are not members, and therefore contribute nothing to the support of the Institute.

Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a loss. The loss, however, decreases with an increase in membership.

Special Notice Checks payable by banks in Cristobal, Panama, Pearl Harbor, Honolulu, Haiti, Santo Domingo and Colon are liable to a collection charge of twenty-five cents.

In using these checks for remittances payable to the Naval Institute please add twenty-five cents to the debit amount as the Institute has to pay these charges.

Dues The annual dues ($3.00) for the year 1922 are now past due.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of their resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid for at one-half the rate for original articles, or about $2.25 a page.

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The Institute Book Department will supply any obtainable naval, professional, or scientific book at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books should be considered. The cost will not be greater and sometimes less than when obtained direct from dealers.

Attention is invited to the following books, now ready for issue:

The Boat Book, 1920—price: 50 cents.

Landing Force and Small Arms Instructions, price: $1.00.

Principles Underlying Radio Communication, 2nd edition (comprising radio communication pamphlet No. 40, prepared by Bureau of Standards; revised to May 24, 1921 by Signal Corps, U. S. A.) price: $1.00.

Address orders to: U. S. Naval Institute, Annapolis, Maryland.

Articles

The Institute desires articles of interest to all branches of the service, including the reserve force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

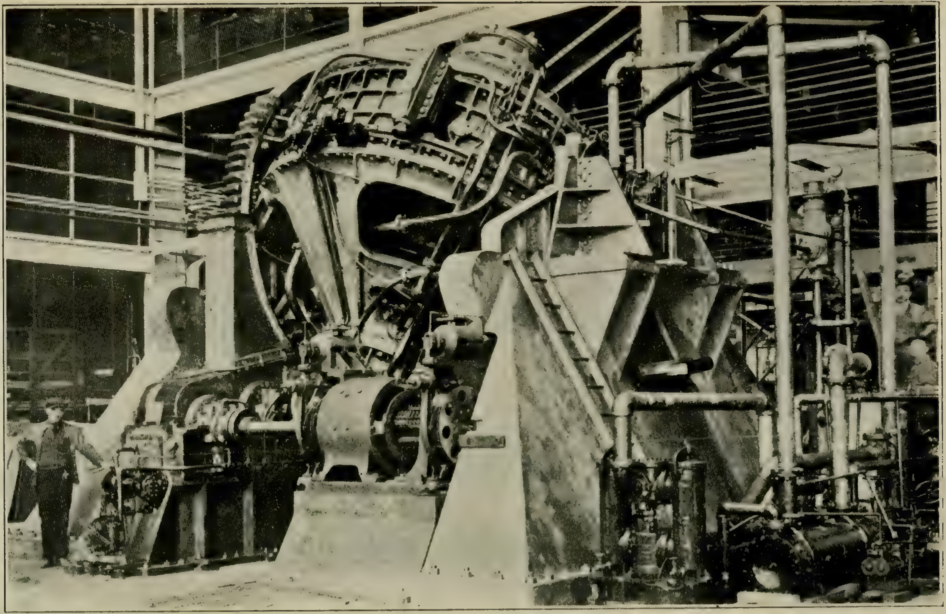
All articles and discussions submitted by persons belonging to the navy for publication in the PROCEEDINGS must be in duplicate, one copy being signed by the author, which will be submitted to the Navy Department when the original is published, as required by General Order No. 46, of May 20, 1921.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished can be greatly reduced if the reprints are struck off while the article is in press. Twenty copies of reprints are furnished

authors free of charge. Authors are requested to notify the secretary and treasurer of the number of additional reprints desired when the article is submitted.

INFORMATION INDEX



Sperry Gyro-Stabilizer for "Hawkeye State"—View Showing Stabilizer in Precessional Position at the Westinghouse Works, Philadelphia.

This is the largest stabilizer ever built, and the first to be installed in a passenger ship.—*The Marine Engineer and Naval Architect*, June, 1922.

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER F. W. ROCKWELL, U. S. NAVY

GENERAL ARRANGEMENT

GREAT BRITAIN

AN EMPIRE NAVY.—Last week we referred in this column to the somewhat extraordinary fact that while we are whittling away our naval strength in this country the Dominions appear to regard the present moment as timely for reducing their own fleets. In connection with this important subject the naval correspondent of the *Morning Post* makes a suggestion which deserves the utmost consideration. Briefly surveying the work and results of the various Imperial Conferences which were held before the war, and which led to the institution of Dominion navies, he asks whether the time has not come for reopening the questions that were then settled. His view is, and it is that of many other people, that after the reductions which the Dominions are making there will be so little left that it becomes a question whether the retention of so little is worth while. Would it not be better, he suggests, to pool resources and establish a central striking force of maximum mobility? Certainly it is worth consideration by the Dominions whether on some such plan they would not get a more effective return for their money than by spending it on skeleton navies with little or no power of expansion behind them. The Prime Minister said the other day that "he had always been conscious that the ultimate support of peace and freedom must be force—force guided by right, but still force." Assuredly Mr. Lloyd George must be aware that the force he must mainly rely upon for the purpose he talks about must be the British navy. The Premiers of the self-governing Dominions must be equally aware of this fact. Lord Northcliffe pointed out to them very clearly and candidly what the shelter of the British fleet meant to them. It seems, therefore, most suitable and appropriate at the present moment to attempt reconsideration of the whole question of Imperial naval defense, and for that purpose to call together another Con-

ference in London to discuss the matter.—*Army, Navy, and Air Force Gazette,* 3 June, 1922.

BRITISH SEAPLANE FLOATING DOCK.—It is announced that the seaplane floating dock, which has been under construction at Sheerness Dockyard to the orders of the Air Ministry, has now been delivered as ready for service. For the present, the craft has been berthed in the Medway, near Port Victoria. The dock, which has an over-all length of 143 ft. and a lifting capacity of 200 tons, will accommodate two large modern seaplanes, has thirteen buoyancy compartments, each flooded direct from the sea and emptied by blowing with compressed air. The power for the air compressors is supplied by two oil-driven dynamos, which also provide the current for lighting and power for workshop machinery, capstans, winches and pumps. An interesting feature is the supply of petrol to seaplanes from a large storage tank on the deck by means of the Bywater hydraulic system.—*Flight.*

FUEL FOR THE FLEET.—A wide range of subjects was covered by last week's debate on the Navy Votes for works, wages, etc. In dealing with the question of oil-fuel storage the Civil Lord of the Admiralty said, very rightly, that provision of oil supplies was vital to the fleet. The Admiralty, not without grave misgiving, asked for a sum of money that would permit of the creation at various strategic points of oil reserves which represented the absolute minimum for future requirements, and if these were not forthcoming the fleet would be deprived of its mobility, without which it would be absolutely useless for any purpose whatever. The provision of such supplies is, therefore, of paramount importance, and the limited sum to be appropriated this year is only the first instalment of a much larger amount that will have to be spent sooner or later. Several speakers in the debate criticised the erection of "gasometer oil-tanks" on the coast, where they would offer conspicuous targets to hostile aircraft or long-range guns. This method is certainly open to objection, but to put all the tanks underground would involve a tremendous expenditure which the country is in no condition to stand.

The Admiralty evidently believe that it is better to have exposed tanks than none at all, for there is not the slightest doubt that a request for the millions of money needed to provide underground tanks of the necessary capacity at naval stations at home and abroad would be summarily rejected. Incidentally the debate brought from Lieut-Comdr. Kenworthy a presumably authentic explanation of the so-called "Mystery Towers," which, it appears, were to have been sunk at selected points in the Dover Strait to frustrate the passage of enemy submarines. This is the theory which has always found the most general acceptance, though some imaginative people thought the towers were intended to be towed into the German rivers for the purpose of sealing up the High Sea Fleet. The tower at Shoreham has proved an unmitigated nuisance since it was dumped there, and in now deciding to spend £17,000 on demolishing it the Admiralty have probably taken the wisest course.—*Naval and Military Record,* 31 May, 1922.

THE MYSTERY TOWERS AGAIN.—Further to the note in the *Journal* of April 7, we have now to record a few additional facts concerning the so-called mystery towers, gleaned from the remarks made in the House of Commons on Tuesday in the course of the consideration of the Naval Estimates. It appears that at the date of the Armistice there were fourteen "towers" under construction. Since the Armistice a sum of about a million pounds has been spent on them, partly for the purpose

of completing the two which had reached an advanced stage at Shoreham, but principally on the demolition of the other twelve. One of the completed towers is now in use taking the place of the old Nab Lightship and for certain undefined experimental purposes. A sum of £17,000 has just been voted for the demolition of the second completed tower, which still remains in Shoreham Harbour. Altogether the sum of £1,180,000 represents the bill which the country has to meet in connection with the construction and demolition of these towers, the precise function of which has never been officially disclosed.—*The Engineer,* 26 May, 1922.

POTENTIAL MILITARY MAN-POWER OF THE BRITISH EMPIRE.—It will be remembered that in our issue of December, 1921, we published an article on the leading armies of the world, showing the strength of the various active armies, their strength in trained reserves, and the total available man-power of military age. The table for available military man-power credited the United States with 15,700,000, Great Britain with 25,000,00, and France, Italy, Germany and Japan with from 5,000,000 to 6,500,000 men. Since the publication of that article we have been in receipt of correspondence calling in question the large figure of 25,000,000 military man-power credited to Great Britain, and in response to our application for the figures as estimated by competent authorities of the British War Office, we have received the data given below.

The total male, white, population of the British Empire is estimated at 30,000,000, and of these we are informed that 30 per cent, or about 9,000,000 are males of military age, fit for military duty.

It will be evident to anyone who read our article, that the high figure of 25,000,000 was due chiefly to a liberal estimate of the military man-power which would be derived from the teeming millions of India, and in the table which we gave it is stated in a footnote that in the estimate 5 per cent of the total population of India was estimated as being available. The World War Office advises us, however, that as regards colored man-power, it considers that reliance cannot be placed on a larger figure than 3,000,000, as representing the number of colored males fit for use as fighting troops.

The numbers who might be regarded as man-power from the point of view of labor, or ancillary services, depend upon the exigencies of the moment. If the figure of 1,000,000 be taken as being the maximum requirement relative to the 9,000,000 white and 3,000,000 colored males, as mentioned above, this would give the grand total of man-power available as 13,000,000.

It must be remembered, moreover, that although the men of some of the tribes in India are noted for their stamina, courage, and amenability to discipline, and have proved their worth in various branches of the military service, the great mass of the Indian population has neither the physique nor other qualities that are necessary to the makeup of a soldier.—*Scientific American,* July, 1922.

PANIC EXPENDITURE.—To those who recognize the symptoms it must be clear that unless some glaring scandal proves a red herring this country must expect before long to find itself in the throes of a scare. Readers of this journal will not be surprised, for, as is well known, history repeats itself, and scares and panics invariably follow the wholesale reductions of the armed and disciplined forces after a successful war. It has been shown here how after the peace of 1815 scares followed one another in quick succession owing to the cutting down of the navy. It was always some new invention or some novel method of warfare in which it was supposed that other nations were advancing quicker than ourselves which started the trouble. Sometimes there was a real and genuine cause

for alarm, but in nearly every case panic expenditure proved extravagant and wasteful.

The danger to which we are assumed now to be exposed arises from a belief that we have an inadequate air force. And the panacea proposed is to cut down the army and the navy to a still greater extent and spend the money thus saved on subsidising civil aviation. Of course, the air force is inadequate if there is any real danger of an attack. We are, as it is said, at the mercy of the first hostile power that launches an attack from the sky. But it may also be contended that as a result of recent reductions the navy and the army are inadequate, too, and would succumb to an attack by land and sea from a superior enemy power. It is a little difficult, however, even to imagine which is to be the hostile power in either case. And, again, whereas in all the earlier scares and panics it has been the armed and disciplined forces of the country upon which expenditure was demanded, in this case it is something entirely different and novel. We have no doubt that civil aviation is an excellent thing to encourage, and we do not question the motives of those who wish it should be supported from the public funds. But the new director of civil aviation has promised a real policy, and until this is proved to be disappointing it is just as well that the country's confidence should not be shaken by phrases such as "the dykes have been swept away" or "the navy can no longer safe-guard the homes of the British people." —*Army, Navy, and Air Force Gazette,* 17 June, 1922.

FRANCE

ARMAMENT OF THE CRUISERS OF THE BOUVET CLASS: THE ANTIDOTE TO AERIAL BOMBARDMENT: THE NAVAL ACTIVITY IN THE CHANNEL: FRENCH VERSUS BRITISH AVIATION METHODS.—The distribution of the armament on board is a determining element of fighting efficiency to which the French were the first to devote attention, as a comparison will show between the end-on cruisers designed by Ingenieur-General de Bussy (Depuy de Lôme, Descartes, etc., 1889-92) and the homogeneous series of broadside cruisers by Sir William White. Since then the British have beaten the French so far as military utilization of armament is concerned with the ships of the dreadnought era. The actual ambition of the Paris Section Technique is to regain the lead; hence the controversy in expert circles merits of axial gun batteries, that provide the maximum of arc and command of fire, and of side turrets in échelons that give a distinct advantage in the case of end-on contests. If the cruiser actions of the war are re-fought it will be found that superiority belongs to the turret disposition, as in the Jaurréguiberry and in the new Bouvets.

France suffered more from aerial attacks than any other belligerent nation, and, as a consequence, she devoted special attention to anti-aerial defence, realizing more in that branch of the war preparation than any other power. As recalled by Sir Percy Scott, there were French ideas and French guns that first defended London against aerial pirates in 1915. Since then substantial progress has been made, scientists and officers having kept in close co-operation, under the guidance of General Ferrié, head of the Army Anti-Aerial Defence Department, with a view to finding a satisfactory solution to a defensive problem that is felt to be vital for the security of France; and it is vital also to England, the Boches having, since the Rapallo Treaty, the means of acquiring anew the aerial supremacy. The little that has been rendered public testifies to French ingenuity and scientific attainments, and gives ground for the belief that the Republic is, with the possible exception of the United States, better prepared than any other power for the purposes either of aerial offense or defence.

The experience of the war showed that the "defense directe" of a city against bombardment aviation groups, that is, by means of counter aerial squadrons, is an operation very difficult to successfully carry out, and for two reasons: (1) the keeping in the air of permanent patrols ever waiting for enemy attacks has proved impracticable; thus, out of 45 avions detailed to the active defence of Paris, it was only possible to have five at all times in the air, and they only represented an illusory protection against the numerous squadrons which the enemy launched against the French capital. (2) As Commandant Ortlieb has shown *(L'Aéronautique,* Masson, Editeur), it takes nearly an hour for a defence squadron to be "alerted" and in a position to fight at sufficient altitude; which means that no direct defence can be opposed to unexpected attacks. The heavily-loaded Boche bombardment Gothas, that flew at a rate of some 70 miles per hour, delivered their worst night attacks on Paris when the German front was within 60 miles of the great metropolis (1918), and the Paris defence squadrons could not be warned in time of the impending onslaught. This means, also, that ports militaires and great cities situated, as London is, within 60 miles from the sea, could not be effectively defended by counter-aerial attacks against sudden aggression coming from the sea border, a truth which piratical Zeppelin raids partly demonstrated.

Therefore for such vulnerable centres as London and most naval bases, safety is to be sought in efficient mobile artillery barrages, consisting of successive screens of mitrailleuses, quick-firing and special guns both disposed in fixed batteries and on motor-trucks, and directed by an up-to-date detecting service. Terrific storms of bursting shells and thunder-like detonations, and incredible waste of ammunition greeted the first coming of the Gotha bombardment machines over Paris in the spring of 1918, but soon the French power of reaction in the face of danger and of improvisation was made to tell, and on the night of September 15-16, 1918, although the enemy employed 483 planes in an ultimate effort, only 37 could actually reach Paris, and 13 machines were brought down by French anti-aerial guns; and had the war gone on much longer it would have witnessed a tremendous execution of Boche bombardment craft. The secret (at least the initial part) of these gratifying results is revealed in a valuable booklet by Captain Baillaud (just published by Berger-Levrault, Rue des Beaux-Arts, Paris), that gives technical accounts of the various appliances and devices employed to locate with unerring accuracy fast traveling enemy machines and promptly to submit them to the blinding glares of converging searchlights and to the tender mercies of hurricanes of gas shells. Boche aviators, though brave and well-trained, strongly objected to these Gallic innovations, and, in October, 1918, they could not get over their dislike for night trips over the Gay City, and they sighed for the efficient armouring and silencing of motors, alone capable of minimizing the danger from the French "paraboloïde" listeners, "altitraceurs," and special projectors and fire control devices by Commandant Bochet.

Remarkable training activity is being displayed by the seagoing "Division de la Manche" under Rear-Admiral Lequerré, who has his flag on the 18,000-ton *Voltaire* and is ever at sea, with attending destroyers, submarines, and seaplanes, trying to do justice to a crowded time-table, seeing to his specialists keeping proficient with gun and torpedo and with the new modes of signalling, experimenting with new tactical devices based on a profuse employment of mines, long-range torpedoes, armoured torpedo-planes, and camouflaged gas clouds. Startling developments, both for attack and defence, are to be expected from the wholesale use of artificial clouds of varying density, colours, and poisonous propensities, the effect of which will be to considerably minimize the advantage of mere numerical ballistic superiority. On paper the French fleet has dwindled

to insignificance. It is the ambition of French naval men to make it a very ready force, as efficient as ceaseless scientific progress permits it to become, and alive with the old traditional spirit that would suffer, however despairing the circumstances, no Scapa Flow à la Boche.

Previous to 1914 the Lapeyrère Armée Navale prepared "la bataille navale" on the high sea in the good old human and loyal Suffren-Nelson style. To-day the war has altogether changed the problem: artillery contests on the high sea represent a thing of the past for French officers, whom their present numerical inferiority, and also their deep sense of wrong at the Washington trick, have converted to the worship of submarine and aerial arguments, and, in Admiral Lequerré's mind, the absorbing question is: How to meet and lure into destruction superior enemy forces; how to utilize to the utmost the resources of chemical and aerial warfare. It will be admitted that a fighting brain confronted with the preparation for action against great odds, will do more, and produce a greater effort of imagination, than is assured of having an easy superiority over any likely opponent. It is for reasons of this sort that the Channel fleet, though very inferior in material, is considered to be in advance of the Toulon force in some branches of training.

In the aerial, as in the naval, field of war preparation France may be said to think tactically, whilst Great Britain thinks strategically and in a spirit of offensive. Whereas Britain is concerned with long-distance flights and spares no effort to keep the whole globe within the radius of action of her giant flying machines and of her dogged aviators, France is centering her best attention on perfecting the military machine, the aviation de combat. The interesting aerial demonstrations now taking place at Le Bourget, near Paris, testify to the marvellous efficiency and daring of the pick of Gallic aviators, who have ever their eyes on the eastern frontier and are better prepared than all rivals for those aerial duels that gave glory to Guynemer, Fonck, and so many other "as de l'air," and are naturally the dream of every budding aviator. Speed, handiness, and aptitude to climb are the qualities that tell in air contests, and the performances accomplished point to steady progress, this being the result of co-operation between flying experts and designers. The misfortune is that greater financial and industrial resources are being employed in Bocheland towards a similar end.—*The Naval and Military Record,* 7 June, 1922.

THE COMING BOCHE REVANCHE AND THE NEED OF A STRONG FRENCH NAVY: AMMUNITION TESTS: IS THE AERIAL FORCE READY FOR WAR? BELATED DESTROYER: THE TRICOLOUR IN THE PACIFIC.—The Bocho-Bolshevist alliance, signed at Rapallo, is giving food for thought to French experts who, without wasting time in useless recriminations, are facing the new situation and getting themselves ready for the now unavoidable storm. Service journals, and especially the *Revue Militaire Générale* (Berger-Levrault, Editeurs), are discussing at length the various aspects of this engrossing problem. The Prussians, crushed at Jéna (1806), only required seven years to take their revenge at Leipzig (1813), where the bewildered French saw arrayed against them a formidable army which the Prussians had managed to secretly prepare and efficiently equip under the very eyes of Napoleon's generals! This time the Germans will not need to wait so long to have a tremendous superiority over France in the matter of numbers, financial and industrial resources, and also preparedness for the novel conditions of warfare (aerial and chemical) that so well lend themselves to secrecy.

General Magnin, who has made an extensive tour through Germany, was deeply struck with the industrial prosperity and capabilities of uninvaded and intensely revengeful Bocheland, and, considering all points, especially the fact that next time France must rely on her sole forces, he sees no other

way of avoiding defeat than by bringing to the rescue one million trained African soldiers across the Mediterranean and the Atlantic, which, of course, is only possible with the command of the sea, and calls for an additional French naval effort it would not be safe to delay any longer.

The non-execution of the Versailles Treaty makes of Germany the real victor of the Great War. General Magnin is convinced that the Berlin War-office could very shortly put in the field seven million trained soldiers, equipped with superior post-war armament, and especially with superior Berthas and chemical organization; and, comparing the situation of weakened and devastated France, he thinks the official singing of *Deutschland über alles* by all German sporting and military associations is no mere bravado. France, the only barrier between Deutschthum and European hegemony, is getting too weak for the task her geographical situation imposes upon her. General d'Urbal is of opinion that the only hope of success lies in prompt offensive far into Germany that ought next time to be used as the battlefield.

That the quality of the shell, or of the bomb, is a determining factor at sea has been demonstrated at Jutland and in other encounters. Hence the importance attaching to the series of experiments that, ever since the armistice, have been going on in France, both afloat and ashore, with a view to embodying in naval ammunition both the lessons of the war and the results of scientific progress, especially in the chemical line. It was this French liking for experiments and innovations that brought to life the famed "obus alourdi," the best pre-war projectile. The 1921 tests in the ex-German *Thüringen* off the Brittany coast gave proofs of the excellence of the new 13.4 and 18-inch shells, whilst the aerial bombardments to which the ex-Austrian *Prinz Eugen* was submitted last year opened the eyes of unbelievers to the capabilities of aerial weapons, finally bringing about a reorganization of the Admiralty aeronautical department under Admiral Lanxade, who is a go-ahead, fearless aeronaut and aviator. The *Prinz Eugen,* twice sunk and raised, is being patched up anew preparatory to being towed to sea for the purpose of being used as a target at extreme range by the 12 and 13.4-inch weapons of the Salaun fleet. the *coup-de-grâce* to be given by Latham and Nieuport bombardment seaplanes, and, if need be, by long-range torpedoes. The first part of the firing programme is to take place next month, and, later on, will be continued in the target-ship *Vergniaud.*

The aerial force is all one, being susceptible of being employed either over land or sea, at least for the purposes of European warfare. French public opinion regards air power as being of more moment than sea power, and takes it for granted that France is still supreme in the air. But, if critics are to be trusted, this is far from being the case. Député Boussenot declares that France is defenseless both on sea and in the air. Député de Montgou can hardly master an adequate supply of sarcasms to express his contempt for the confusion and inefficiency prevailing in the army aerial service, as the result of incompetent non-flying senior officers being placed in charge of aerial departments and of aerodromes: plenty of gold stripes and stars, but no notion of aerial requirements, and about the mind of a hen having hatched ducklings! Everywhere grumbling, disgusted aviators, and flying matériel in poor condition: the situation he considers worse than it was on the eve of the war, and he has no doubt as to the virtual superiority of German aviation. Aerial journals are naturally joining in this fine concert of lamentations and taking aerial authorities to task for their grievous mistake in exclusively considering the requirements of military aviation and in ignoring the needs of commercial aviation. A spirit of discontent also prevails in the large aeronautical associations, and the recent Bourget aerial tournament was poorly managed and not the success it had been expected to be.

It is only right to remark that France is "le pays de la libre critique" and that things have a way of never being quite so bad as depicted, and, on the other hand, the present wave of criticism can but spur the authorities to action and make the flying army of France even more efficient than it is now. The number of efficient pilots is steadily increasing in and out of the army.

Recent tests near Paris showed that a Spad or Nieuport "avion de combat," good for a horizontal speed of some 160 miles per hour, can climb to a height of 6,000 yards in 15 minutes, which means a considerable advance on war performances, and is also of vast importance in connection with the defence of cities and ports against bombardment squadrons. France has not forgotten how her finest cities suffered from the superiorly-equipped night bombardment squadrons of Bocheland. In the matter of carrying power, weight and destructiveness of bombs much progress has of late been made.

It is typical of the extent to which the French navy has sacrificed her interests to the Allied cause that she should only be just recovering from the effects of the war and be now completing the destroyer *Gabolde,* of 82.6 métres length 8.2 métres width, and 930 tons displacement, that was commenced so far back as November, 1913, by the Normand chantiers at Havre and is merely preparing for her trials. Modifications have been made in the original designs, and the *Gabolde* will be the most interesting and powerful French-built flotilla unit. Her trials will be awaited with all the more interest as her builders have to maintain a time-honored reputation for speed, having given to the French navy her fastest and most reliable contretorpilleurs from the 31-knot *Forban* (1895) down to the 36-knot *Bouclier* (1909). The new destroyer has four Normand boilers and five Parsons geared turbines, and is expected to develop at least 23,000 h.p., against 18,000 h.p. for her earlier sister ships *Koux* and *Lestin,* which did 31-knots, and against 18,000 h.p. also for the Italian boats of the Medici class (1916-19), some of which reached 34 knots, with a displacement of 830 tons. No wonder she is expected to do 35 knots in a light condition. It will be remembered that the war-built British destroyers of the *S* and *T* series, of about similar displacement, much excelled on this figure in service.

The *Gabolde* is something of an experimental vessel in the shape of her hull and in her armament of three 4-inch guns, two of which are super-imposed to fire right ahead, as in the British Verdun class. She is thus designed for offensive work, which is rather unusual in the Gallic navy, and tactically, apart from her superiority in speed, she surpasses both the German-built *Chastangs* and the French-built *Aventurieurs* (1,000 tons, 29 knots, and four guns of 4-inch on the axial lines). She will reinforce this summer the Channel flotilla under Captain Valdenaire.

Rear-Admiral de Cacqueray (born 1867), who rendered distinguished services as flotilla commander in the Adriatic (being promoted for his dash and ability), is this summer to show the Tricolour in the Pacific with the two 12,600-ton armoured cruisers *Hugo* and *Ferry* (1903), carrying 20 guns of 6.5 and 7.6-inch, of imposing appearance, and very roomy and comfortable, that have just benefited from extensive refit and are good yet for 21 knots. These four-funnelled cruisers are, of course, obsolete in speed but their armament is superior to that of any modern light cruiser.—*The Naval and Military Record*, 14 June, 1922.

NEW ESTIMATES.—The naval programme was passed by the Senate on March 16 by 197 votes to 96. The Minister of Marine is authorized to lay down during 1922 three light cruisers, six destroyers, twelve torpedo boats and twelve submarines. The conversion of the half-built battleship *Bearn* into an aircraft-carrier is also to be started. The gunboats

Moqueuse and *Malicieuse* are to be transferred to Saignon for sea-police and hydrographical duties.—*Journal of the Royal United Service Institution*, May, 1922.

JAPAN

NAVAL SHIPBUILDING IN JAPAN.—According to recent advices from Japan, the conclusion of the Naval Limitation Treaty threatens to cause a serious dislocation of trade and industry in that country. Since the slump in mercantile tonnage set in a great many of the shipbuilding yards which sprang into existence during the war have closed down, while those that remain are finding it more and more difficult to carry on business. When the European War broke out there were only four yards in Japan which could construct ships of more than 1000 tons, but in 1918, when the tonnage boom was at its crest, the number of yards capable of building such vessels had risen to forty-five. To-day only about sixteen survive, and few of them are working on a profitable basis. With the steady falling off in the demand for new merchant vessels, the Japanese shipyards have come to rely largely on naval contracts to keep them employed, so much so that by the end of last year these contracts represented nearly 70 per cent. of the total work on which they were engaged. At this juncture was announced the Government's decision, in conformity with the Washington agreement, to stop all further work on capital ships, and the position of the shipbuilding and kindred industries at once became critical. At the same time the labor element began to grow restive at the prospect of widespread unemployment following the contemplated dismissal of so many workmen from the naval arsenals and private yards. It was estimated that the complete suspension of all the naval construction in progress last November would have involved the discharge of at least 100,000 workpeople from the shipbuilding, engineering, and other trades which are interested in the construction and equipment of warships. So large and sudden an accession to the ranks of the unemployed would have been a serious matter at any time, but it threatened to entail particularly grave consequences in view of the general economic depression from which Japan, in common with all other industrial States, has been suffering for the past three years. The authorities realized, therefore, that unless something was done to ameliorate the situation, naval disarmament, so far from proving beneficial, might land the country in serious domestic difficulties. Nevertheless, they lost no time in fulfilling the obligations which they had assumed in signing the Limitation Treaty. In January last, orders were issued from Tokyo to cease all work on the capital ships then under construction. The vessels immediately concerned were six in number, namely, the battleships *Kaga* and *Tosa*, already afloat; the battle-cruisers *Amagi* and *Akagi*, which were getting on towards the launching stage, and two similar ships, the *Atago* and *Takao*, of which the keels had been laid only a month or two beforehand. In round figures the six vessels thus discontinued had an aggregate displacement of 250,000 tons, and at least 25,000 workpeople were employed either in their actual construction or the manufacture of their machinery, armament, and equipment.

Now, although the Limitation Treaty places definite restrictions on the number of new capital ships and aircraft-carriers that may be built by any one of the signatory powers, it imposes no such limit on the building of what are described in the document as "auxiliary combatant craft," which include every type of vessel from and below the light cruiser. In these circumstances the Japanese Government decided that the industrial crisis could best be allayed by substituting as many smaller war vessels as possible for the cancelled capital ships. A large number of light cruisers, destroyers, submarines, and fleet auxiliaries had been authorized under the programme of July, 1920, which was to cover a period of eight years, but

apparently the last of these vessels was not due to be completed before the year 1928. Whether special legislation will be necessary to anticipate the original dates of laying down is uncertain, but in any case it seems that a considerable number of such vessels have been begun since the beginning of the year. With regard to light cruisers, the position is as follows:—Completed during 1921—*Kiso, Ohi, Kitakami, Nagara*. Launched during 1921 and now nearly completed—*Isudzu* and *Natori*. Begun during 1921—*Yura, Kinu, Abukuma, Kaku*. Laid down or authorized to be laid down in 1922—*Naka, Sendai, Jintsu, Ayase, Otonase, Minase, Yubari*. Of the above ships, the *Yura* was launched on February 15th, and the *Kinu* is said to be afloat, though her launch has not been officially notified. It is reported on good authority that, with the possible exception of the seven ships commenced or due to be commenced this year, all the light cruisers enumerated are of practically uniform design. The leading particulars of them are as follows:—Length overall, 535 ft.; breadth, 47 ft.; draught, 16 ft.; normal displacement, 5,600 to 5,900 tons. The machinery consists of geared turbines—Parsons in some ships, Curtis in others—taking steam from twelve boilers of a special Japanese design, resembling the Yarrow type. In the course of her trials the *Nagara* developed 65,000 shaft horse-power, equivalent to a speed of 33.4 knots, which is a higher speed than has yet been recorded of any other cruising ship in the world. It is possible, however, that the run in question was made when the vessel was in a very light condition, as is customary in Japan when the preliminary trials of a warship are being held. Eight of the twelve boilers in each ship burn oil only, the remaining four being fitted for coal and oil. So far as is known, the only Japanese cruisers with a complete set of oil-burning boilers are the *Tatsuta* and *Tenryu*, completed in 1919, which are very likely enlarged destroyers, and made 33 knots on trial with 51,000 shaft horse-power. The later ships have side armor of about 2 inch thickness amidships, and are well subdivided—a form of protection which has been very skilfully developed by Japanese designers since the war. As main armament seven 5.5 inch 50-calibre quick-firing guns are carried, all disposed on the centre line and at the same level. In addition, there are two 3 inch anti-aircraft guns and eight above-water torpedo tubes, twin mounted. The fuel supply is said to be larger than is usual in vessels of this type, and with maximum storage the cruising endurance at economical speed is 6,000 nautical miles. It is known that a much improved design, with considerably larger displacement and heavier armament, has been prepared by the Director of Naval Construction, Vice-Admiral Okada, and in all probability several of the ships laid down in the current year will be of this improved type. In numerical strength the Japanese cruiser fleet is second only to the British, and far surpasses the American. For light cruisers built, building, or authorized, less than ten years old from date of completion and with speeds above 25 knots, the present figures for the three navies are as follows:—British Empire, 54; Japan, 26; United States, 10.

The Japanese destroyers under construction early this year numbered at least twenty, of which more than half are large and powerful boats, resembling in dimensions and armament the British destroyers of the "Admiralty W" class. Orders for a further twelve destroyers are reported to have been placed, but in the case of these later boats the building period will be intentionally prolonged. No dependable information is available respecting the submarine programme, but at least six yards, including the State arsenals at Yokosuka, Kure, and Sasebo, have submarines on the stocks. In February last the Kawasaki yard at Kobe announced that it had on its books the contracts for twelve submarines, of which, presumably, some had still to be laid down.

While it is clear from the foregoing brief survey that a considerable amount of new naval construction is still proceeding in Japan, the work in

hand does not in any way infringe the provisions of the Washington Treaty. The Japanese Government is no doubt as sincerely desirous as any other of avoiding a repetition of the building-ship rivalry which has always been a fruitful cause of international conflict. At the same time it has not seen its way to adopt that policy of complete naval disarmament which would have brought ruin upon an important branch of domestic industry.—*The Engineer*, 26 May, 1922.

JAPANESE NATIONAL DEFENCE.—The Tokio paper *Yomiuri* gives the following version of the "new national defence scheme" which is said to have been approved by the highest military and naval authorities: "Owing to the changes in international relations, Japan can no longer rely on the assistance of Britain and America, as she could at the time of the war with Russia. In the event of war, therefore, there is no alternative for her but to continue it by the single-handed efforts of the Empire and try and win a final victory, keeping up, if necessary, a war of four or five year's duration. So the Imperial Army and Navy must devote their whole energies in concert to maintaining sure connection with the Asiatic continent to the last. With the object of accomplishing the above mentioned fundamental object, the national defence lines of the Empire are fixed as follows:—At sea, the line connecting Shumushu Island in the Kuriles, the Bonins, Amami Oshima, and Formosa shall be the first line of national defence, and the command of the neighboring waters of the Pacific, the East China Sea, the Yellow Sea, and the Sea of Japan is to be absolutely maintained. On land, the line connecting Hankow, Shantung, Harbin, and the frontier of Saghalien shall be the first line of national defence, and the area within the line shall be the district for operations in order to ensure communication and connection with the mainland. The Strait of Tsushima shall be the second line of national defence with a view to making a prolonged war practicable.

"The Army.—In order to strengthen the military defences, the garrisons in Formosa, Saghalien, and Korea are to be reinforced first of all. Communication is to be ensured with . . . in order to get coal on the Continent and with . . . in order to get iron, while with a view to obviating any possible sudden change in international relations . . . is to be seized, and in order to secure food supplies from Manchuria, the two points . . . and . . . are to be seized. The remaining troops are to be formed into a force for the line of battle in order that the connection through the Strait of Tsushima may be ensured by means of subsidiary vessels and the army, in the unfortunate event of it becoming impossible to rely on the strength of the main fleet.

"The Navy.—Conditions having become unfavorable to aggressive operations on the high seas as a result of the limitation on capital ships, the first line of national defence shall be desperately defended. Surprises at night are to be resorted to as a rule. But in the event of a balance of strength being secured, aggressive defence is to be ventured upon in the near seas. Throughout the war every effort is to be made to ensure the connection between the Continent and the main land (of Japan)."

Commenting on the above plan, the *Yomiuri* says: "Should such a plan be adopted and carried out, the resolution for a limitation of naval armaments reached at the Washington Conference, the spirit of international co-operation, the resumption of amicable relations with Siberia and China, will all be trampled underfoot, and Japan will be reduced to a position of entire diplomatic isolation. Even though the authorities concerned may not immediately demand a substantial increase in armaments, it will be ultimately necessary to convert the country into an entirely militarist State in order to carry the scheme into execution. Neighboring countries will have to be seized upon and placed under military occupation. Social

and economic interests at home, as well as diplomatic and trade relations abroad, will all have to be sacrificed thereto, with the result that the country will be regarded as a second Germany. This policy of self-sufficiency and self-supply will thus prove a suicidal and fatal policy for the nation. There will no longer be any question of relieving the burden of taxation, and nothing more will be heard of cultural measures and social problems. How are the Government, the Diet, and the nation going to face the challenge thrown down by the military clique?"

According to other Japanese papers, a revision of naval policy was decided upon at a meeting of admirals and high officials of the Navy Department held at Tokio on April 6, when Admiral Baron Kato, Minister of the Navy, made a detailed report of the naval proceedings which took place at Washington during the late Conference. The *Mainichi* states that many of the flag officers present put forward the view that the reduction of the Japanese Navy from an "eight-eight" basis to that of a "six-four" squadron should be compensated for by paying greater attention to the training of officers and men, and to the achievement of a higher degree of efficiency in the various weapons used by the fleet. Amongst the decisions approved at this meeting was one in favor of spending more money on battle practice, torpedo running, and experiments with explosives. A further proposal was that a number of superfluous admirals should be retired forthwith to accelerate promotion, thus giving better opportunities for advancement to young and talented officers. Each admiral compulsorily retired is to receive a solatium equivalent to two years' full pay. The vote for naval educational purposes is to be doubled and an extensive programme of gunnery, torpedo, and other experiments against ships on the disposal list is to be mapped out. It is announced also that in order to restrict unemployment in the dockyards five special service ships are to be laid down at an early date, work on subsidiary craft (presumably cruisers, destroyers, and submarines) is to be accelerated, and every effort made to give the dockyards a large share of the work in connection with breaking-up condemned warships. On the other hand, the extension works at Kure and other naval ports, including the construction of large graving docks and basins for capital ships, will not now be proceeded with, as the requirements of the limited post-Conference squadron are adequately met by existing facilities. Contrary to rumor, it is not proposed to close the naval stations at Maidzuru and Port Arthur, but neither port will be further developed.

An interesting ceremony took place at Kure in April, when a number of warships belonging to that station were paid off for disposal. The vessels in question were the battleship *Suwo,* the surveying ship *Yamato,* the old cruiser *Chiyoda,* the destroyers *Murasame, Asagiri, Asashio, Shirakumo,* and *Kagero,* and four torpedo boats. Before each ship was paid off the crew mustered on the quarter-deck, facing the ensign, and were addressed by the commanding officer, after which all present sang the National Anthem, and the ensign was then lowered. A few of the vessels in question are to be kept for subsidiary service, the *Suwo* being earmarked for service as a submarine school and the *Chiyoda* as a depôt ship for submarines, but the remainder will be broken up.—*The Naval and Military Record,* 31 May, 1922.

WATCH JAPAN.—It is doubtless no more than a coincidence that at the moment certain British papers are putting up the headline "Watch Japan" we find in an American Service contemporary an article headed "Is Japan Sincere?" The circumstance which appears to arouse apprehension is not the same in both cases, but behind it is the fact that the Pact of Washington has given to Japan a naval predominance in the Pacific which, if it existed before, had not been so widely realized as it is now. The New York paper says: "We are now impotent against any effort by Japan contrary to

American interests in the Orient." Over here it is reported that in Australia grave uneasiness is caused by the programme of shipbuilding which Japan has in hand. The American writer is not so much concerned about the ships, but protests against the unwisdom of reducing the naval *personnel* when it is not in the bond. Practically the same thought must have its influence in Australia, for when the *Sydney Morning Herald* considers it will now be essential "for the Mother Country and the Dominions, especially Australia, to co-operate in the establishment of an adequate cruiser squadron in the Pacific," the first question to arise concerns the provision of trained officers and men for the crews of such a squadron. Yet the same papers which print the Australian appeal are crying out for a further reduction of our naval strength.—*Army, Navy, and Air Force Gazette*, 17 June, 1922.

JAPANESE DENY EVADING TREATY.—The admiralty today issued a formal statement flatly denying recent reports that Japan was evading the Washington naval treaty by increasing construction of auxiliary vessels.

The statement, which outlined the tentative auxiliary program, also announced that Port Arthur, taken from the Russians in the Russo-Japanese war, would be abandoned as a naval port.

Japan's auxiliary naval program, according to the admiralty, while still uncompleted, probably will consist of four cruisers of 10,000 tons each, and 4 of 7,000 tons each, 24 first-class destroyers with an aggregate tonnage of 33,000, and 24 submarines with an aggregate tonnage of 28,166.

This, says the official statement, represents a reduction of 13,395 gross tonnage, or 1 cruiser, 13 destroyers and 24 submarines less than the original program for ships to be completed in 1927.

Obsolete ships will be scrapped as new ones of the same type are completed. The new plans involve a greater total cost than the old program, owing to increased expenses in material and labor, but saving is to be effected by converting the port of Maidmura from a naval base to a naval port and abolishing the naval port of Port Arthur. This will be accomplished as soon as ratification of the Washington treaties is a fact.

The reduction in tonnage will necessitate dropping 12,000 officers and noncommissioned officers from the naval rolls.—*Baltimore Sun*, 4 July, 1922.

GERMANY

THE SUPER-DESTROYER TYPE: A REJOINDER TO CRITICISM.—Some remarks of mine published in *The Record* of October 12 last under the caption, "A German Shipbuilding Failure," and dealing with the design and seagoing qualities of the big German flotilla leaders *S 113*, *V116*, etc., have aroused the ire of Herr Ahnhudt, a well-known German naval constructor, who, in the latest number of *Schiffbau* reproduces the offending article in full and endeavors to confute my statements. He declares that the type in question, so far from being a failure, proved completely successful on trial, and suggests that the erratic behavior of the *Amiral Sénès (ex-S 113)* since she has been in the French service was due to French ignorance of her design, which embodies, inter alia, a system of anti-rolling tanks on the Frahm principle. He then affirms that the selection of the *Amiral Sénès* to convey President Millerand on his recent voyage to Africa proves the vessel to be an admirable sea boat, and concludes with a homily on the wickedness of foreign critics who seek to disparage, from base and sordid motives, the faultless products of German science and industry.

Herr Ahnhudt should be more careful of his facts. It was not the *Sénès* but the cruiser *Strasbourg* that conveyed President Millerand to Africa, though the *Sénès* was detailed for escort duty on this occasion, when, according to Press reports, she again distinguished herself by the violence of her rolling. He is mistaken also in assuming that the French, when they took over *S 113*, were ignorant of her anti-rolling device.

This was discovered when Allied officers paid their first visit of inspection to the *S 113* and *V 116*—that is to say, a considerable time before they were handed over to France and Italy respectively. It consists of two wing compartments abreast the two aftermost boiler-rooms, connected by cross-passages under the boilers, and holding about 250 tons of oil. There are other interesting features in this type, which possibly represent the boldest departure from conventional practice that German constructors ventured to make during the war. On paper they were easily the most powerful destroyers ever built, and in particularly favorable conditions of weather and visibility they might have justified their conception of wiping up any hostile torpedo craft that ventured to oppose them.

Infinite pains had been taken to localize damage above and below water, and there is no doubt that the *S 113* and her sister would have been hard to sink by gunfire, ramming, or sub-surface attack. Each of the four oilfired boilers was in its own watertight compartment; each set of machinery—turbine straight drive—with its condensers, was isolated; and the double bottom and wing compartments extended throughout the machinery spaces, oil fuel being stowed in the double bottoms beneath the boilers. Generally speaking, the sub-division was as good as it possibly could be in vessels of the given tonnage and dimensions, though the inevitable result was to make space below deck very cramped, especially in the engine-rooms. The total oil capacity is understood to have been about 640 tons, including oil in the anti-rolling tanks, which was equivalent to a steaming endurance of 3,400 miles at 15 knots. German accounts claim for the type a maximum speed of 36 knots; other authorities consider 32 knots to be the best that the boats could do at full load. The armament comprised four 5.9 inch (40-cal.?) guns on mountings giving very high elevation, and four 23.6 inch torpedo tubes. Herr Ahnhudt denies that any structural changes were made or contemplated in these vessels after completion, and I accept his assurance, though it was reported, on apparently reliable authority, that at the date of the armistice the bow section of one or two of the class was being rebuilt. The account of the *Amiral Sénès'* alarming behavior under helm—as given in the *Record* of October 12—was communicated to me by an officer who was on board the vessel when she circled the Allied fleet at Havre during the Maritime Week last year.

Herr Ahnhudt is altogether wrong in his surmise that a plot exists among foreign critics to throw contempt on German shipbuilding. In England, at any rate, the many excellent features of German naval construction before and during the war have been frankly acknowledged, though there is a natural reluctance to admit that German designs were pre-eminent in all respects. As one who has studied both German and British technical literature for many years past, I have no hesitation in saying that British journals, as a rule, judge every foreign design on its merits and display no national bias in such matters. On the other hand, the German technical Press damns everything foreign on principle, and in particular seems absolutely incapable of printing an objective and detached criticism of any foreign naval design. Before the war a widespread and obviously subsidized propaganda campaign was conducted in Germany for the purpose of disparaging British shipbuilding and naval equipment, and it looks as if this campaign has now been revived. As regards German construction, the most damaging criticism I have ever read was that which the late Admiral von Pohl gave in his diary *Aus Aufzeichnungen und Briefen während der Kriegszeit.* Special attention may be directed to the admiral's letters dated March 16, July 17, July 19, and August 17, 1915, which throw a flood of light on the defective state of the machinery in many of the best ships belonging to the High Sea Fleet, and that a period before the efficiency of the personnel had begun to deteriorate.—*The Naval and Military Record,* 7 June, 1922.

UNITED STATES

SHIPS—BUILDING AND PROJECTED

NOTE: No Restrictions on Any Type Except Capital Ship and Aircraft Carriers.

	Great Britain		United States		Japan		France		Italy	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Light Cruisers, 1st line..........	0	0	10	75,000	15	81,900	3	24,000	2	16,000
Destroyer Leaders..	1	1,750	0	0	0	0	6	14,400	6	12,270
* Destroyers, 1st line	3	3,725	3	3,645	50	58,500	12	16,800	12	11,680
Submarines, 1st line.	4	5,800	36	31,561	23 52	20,394 Tonnage Unknown	12	13,200	4	2,600
†Fleet submarines..	0	0	3	6,375	0	0	0	0	0	0
Aircraft carriers....	Estimated all Powers will Build Aircraft Carriers up to Tonnage Allowance									

* 12 Additional Destroyers authorized but not under contract.
† 6 Additional Fleet Submarines authorized but not under contract.
Note: Aircraft Carrier tonnage allowed by Treaty as follows:

United States	—135,000	No aircraft carrier to exceed 27,000 tons except that each power may build two of 33,000 tons providing tonnage allowance not exceeded thereby.
British Empire	—135,000	
Japan	— 81,000	
France	— 60,000	
Italy	— 60,000	

SHIPS RETAINED JUNE 1, EXCLUDING THOSE TO BE SCRAPPED UNDER TREATY

	Great Britain		United States		Japan		France		Italy	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Capital Ships......	22	*580,450	18	†500,650	10	301,320	10	221,170	10	182,800
Cruisers, 1st line...	6	77,200	0	0	0	0	0	0	0	0
Cruisers, 2nd line...	4	46,100	11	139,450	[illegible]	54,672	10	119,108	5	46,500
Light cruisers, 1st line..........	45	189,415	0	0	14	71,350	4	19,402	5	21,000
Light cruisers, 2nd line..........	15	80,345	12	43,175	4	15,830	1	3,444	5	17,300
Destroyer Leaders..	20	34,478	0	0	0	0	1	2,485	6	10,300
Destroyers, 1st line.	182	206,433	292	346,946	55	57,240	20	19,122	27	21,649
Destroyers, 2nd line.	6	4,200	21	15,582	12	7,850	24	16,397	16	11,840
Submarines, 1st line.	47	38,333	57	35,134	23	20,374	24	18,403	10	8,040
Submarines, 2nd line	34	14,608	28	10,975	10	3,259	24	9,610	33	9,610
Fleet Submarines, 1st line.......	6	11,280	3	3,318	0	0	0	0	0	0
Fleet Submarines, 2nd line.......	0	7,200	0	0	0	0	2	3,094	0	0
Monitor Submarines	3	4,800	0	0	0	0	0	0	0	0
Aircraft Carriers, 1st line..........	4	62,590	0	0	0	0	1	24,830	0	0
Aircraft Carriers 2nd line.......	3	25,900	1	12,700	2	15,375	0	0	0	0

* On completion of two new ships to be constructed Great Britain will scrap four capital ships, and total tonnage retained will be 558,950.
† On completion of *West Virginia* and *Colorado*, United States will scrap *North Dakota* and *Delaware*, and total tonnage retained will be 525,850.

SHIPS TO BE SCRAPPED BY TREATY

	Great Britain		United States		Japan		France		Italy	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Old Capital Ships...	20	408,500	15	227,740	10	164,000	0	0	0	0
Capital Ships under Construction..	0	0	13	552,600	6	255,800	0	0	0	0

Note: Any of the powers may retain any two ships, which would otherwise be scrapped, for conversion to aircraft carriers, providing displacement of each does not exceed 33,000 tons.

—*Navy Department Bulletin*, 26 June, 1922.

FEDERAL TAXES COMPARED WITH STATE, COUNTY, AND MUNICIPAL TAXES.—Mr. McLaughlin of Nebraska. Mr. Speaker, under the leave granted to me to extend my remarks I will print the following letter from Captain L. M. Overstreet, United States Navy, showing the amount of Federal taxes compared with State, county, and municipal taxes.

The letter is as follows:

WASHINGTON, D. C., *February 11, 1922.*

MY DEAR MR. MCLAUGHLIN: There seems to be a general feeling that a holiday in battleship building will greatly reduce taxes. A little study of budgets and taxes shows the fallacy of this idea. In our county of York, Nebr., the tax is nearly $40 per capita to meet township, county, and state budgets. The per capita tax for the whole United States for building battleships this year is 64 cents, but Nebraskans contribute about half this amount due to their small Federal income tax, as will be shown later.

According to the World Almanac, 1922, the city of New York has a population of 5,620,000 with a city budget of $345,530,000 (including county budgets and $22,041,000 which goes to the state); the state of New York, a population of 10,385,000, with a state budget of $145,798,000; and the United States, a population of 106,000,000, with a national budget of practically $4,000,000,000. Of this national budget of $4,000,000,000, about 10 per cent, or $400,000,000, is allotted to the entire Navy, and but 1.7 per cent of the national budget, or $68,000,000, to continue the construction of battleships and battle cruisers during this present fiscal year.

If we prorate, according to population, the money to be raised in New York City to help support the government of New York State and of the United States, we find that the people of New York City must raise annually $313,460,000 to support their own city, $10,029,000 to support the five counties in New York City, $78,000,000 to help support the State government, and $212,000,000 to help support the United States Government, or a total of $613,489,000. This means that for every dollar the New York City taxpayer contributes to build battleships and battle cruisers (year ending June 30, 1922) he pays $78 to meet city expenses; $3 to meet county expenses; $22 to meet New York State expenses; and $58 to meet the expenses of the United States Government (building battleships omitted). A holiday in building battleships would reduce expenses in New York City from $100 to $99.38, or a reduction of about six-tenths of 1 per cent.

In the following table a comparison is made between the total annual expenses of New York City and the portions spent on the whole Navy and on building battleships:

Total expenses	$613,489,000
Spent on whole Navy	21,200,000
Spent building battleships	3,604,000

In Chicago the annual amounts to be raised are as follows: $132,000,000 for the city (additional funds are raised for parks and for the sanitary district); $10,800,000 for Cook County; $25,300,000 for the State of Illinois; and $100,000,000 for the United States Government, or a total of 268,100,000. Of this amount, about $10,000,000 would go to the whole Navy and $1,700,000 to continue building battleships. The following table illustrates the annual expenses of Chicago graphically:

Total expenses	$268,100,000
On whole Navy	10,000,000
On building battleships	1,700,000

In San Francisco the city must raise annually $24,467,000 to meet city and county expenses: $6,033,000 for the State expenses of California; and $19,170,000 for the United States Government, or a total of $49,670,000. Of this, $1,917,000 would go to the whole Navy and $326,000 to continue construction of battleships. The following table shows these figures:

Total expenses	$49,670,000
On whole Navy	1,917,000
On building battleships	326,000

From these tables it will be seen that the reduction in city expenses, due to a holiday in battleship building, will hardly be noticeable. This is a popular saying: "The taxpayer is groaning under a crushing load of taxes for battleship building." The above figures do not support such a statement.

Many papers have stated that we will save hundreds of millions annually by stopping battleship construction. How can this be when we are only spending $68,000,000 this year to build battleships? Now, when we break our contracts with the shipbuilders and scrap these ships it will take much of this sixty-eight million to settle legitimate damage claims. The remainder will be needed for the five plane carriers which we are to build in accordance with the terms of the treaty.

What About the Farmers?

Some may say, "Why these charts illustrate what the city taxpayers save by the holiday in building battleships, but what about the farmer?" It will be shown later that battleships are built from money obtained from the Federal "ordinary receipts." The farmer contributes to these Federal "ordinary receipts" a slight amount through the customs (duty on imported articles he might purchase), a slight amount through internal revenue, and, thirdly, directly through his personal Federal income tax. It is assumed that the farmer does not pay a corporation income tax. After taking out his exemptions for himself, wife, and children, few farmers pay much Federal income tax.

In fact, the Treasury Department publication, Statistics of Income, 1919, Income Tax Returns, shows that over half (or 56 per cent) of the personal income taxes for the whole United States come from four States—that is, 31 per cent from New York, 10 per cent from Pennsylvania, 8 per cent from Illinois, and 7 per cent from Massachusetts. If we add Ohio, 4.5 per cent; Michigan, 4.4 per cent; New Jersey, 3.7 per cent; California, 3.9 per cent; and Texas, 2.5 per cent, we can show that over 75 per cent of the personal Federal income taxes for the whole United States, including Hawaii, Alaska, and the District of Columbia, come from nine States. Very little personal Federal income tax comes from the agricultural States. The great grain and cattle States of Nebraska, Iowa, Kansas, Minnesota, and the cotton and tobacco States of Virginia, Georgia, Alabama, and Louisiana all together pay but 6.7 per cent of the Federal income taxes, or less than the one State of Massachusetts.

In our agricultural State of Nebraska there were but 87,344 personal Federal income-tax returns from a population of over 1,296,000 in 1919. The taxpayers who make personal Federal income-tax returns in the whole United States pay an average tax on these returns of over $238, while those making returns in Nebraska pay an average of less than $99 per return. While New York State has but nine times the inhabitants of Nebraska, New York State pays over fifty times the amount of personal Federal income tax and nearly sixty times the amount of Federal corporation income tax. Taxes to support the Federal Government come largely from the Eastern States and from large manufacturing districts.

Where Do National Funds Come From?

Where does the money come from which is used to meet the National Budget? The Treasury Department, Division of Bookkeeping, Form 778, shows for the fiscal year ending June 30, 1921, the "ordinary receipts" amounted to nearly $5,573,000,000. This is the money which is used to meet congressional appropriations. Of this amount $308,000,000 came from the customs, $1,500,000 from the sale of public lands, $683,000,000 from miscellaneous items—coinage profits, Pacific railways, tax on national bank circulation, fees, fines, penalties, etc.—$1,352,000,000 from internal revenue, and $3,228,000,000 from income taxes—of which about two-fifths comes from personal income taxes and the other three-fifths from corporation income taxes. The money from these personal Federal income taxes, therefore, meets about one-quarter of the National Budget. As 1.7 per cent of the National Budget goes to build battleships, this means that one-quarter of 1.7 per cent of a taxpayer's personal Federal income tax, or 40 cents out of every $100, will go to build battleships during the year ending June 30, 1922, at a time when we have six battle cruisers and nine battleships under contruction, a number considerably above the average. The cessation of battleship building will, therefore, reduce the taxpayer's personal Federal income taxes from $100 to $99.60, but the taxes on his property to meet city, county, and State budgets will remain the same. From every dollar the taxpayer pays as a personal Federal income tax one-fifth of 1 cent goes to continue the construction of battleships.

Where Do Taxes Go?

Where does the taxpayer's money go? It goes largely to meet city, county, and state budgets, which are constantly increasing at an alarming rate. In New York City the city budget in 1901 was little over $99,000,000; in 1911 it was $174,000,000; while in 1921 it had grown to nearly $346,000,000. The budget of 1910 would not pay the interest on the city debt of 1921, as the debt is over a billion dollars.

In the agricultural States of the West it is surprising to find even higher rates of taxation to meet state and county budgets, with high rates to meet city budgets. The taxpayers of Lincoln, Nebr., a city of only 55,000 people, have to meet a city budget of over $1,000,000; have to meet their quota of a county budget of $534,000; and their quota of a state budget of $30,000,000. Their quota to build battleships (on a population basis), is but $34,000, but on a Federal income tax basis it would be much less.

The agricultural county of York, Nebr.—population 17,146—must raise over $172,000 to meet the state budget, nearly $520,000 to meet township and county budgets. The people of the county seat, York—population 5,388—must raise annually nearly $190,000 to meet city, township, county, and state budgets. The farmer should realize that the tax he pays on his land, buildings, live stock, and crops go to meet the ever-growing expenses of his township, county, and state, and that not one penny of

these taxes goes to build battleships or to the support of the Federal Government.

The following 18 cities have budgets of over $10,000,000 each, given to the nearest million:

		Millions of dollars
1.	New York City	346
2.	Chicago	133
3.	Philadelphia	59
4.	Baltimore	57
5.	Boston	44
6.	Milwaukee	28
7.	San Francisco	24
8.	Buffalo	24
9.	Newark	22
10.	St. Louis	21
11.	Pittsburgh	19
12.	Seattle	19
13.	Jersey City	14
14.	Cleveland	14
15.	Minneapolis	13
16.	Los Angeles	13
17.	Rochester	11
18.	Providence	10

The following 23 states have budgets of over $10,000,000 dollars each, given to the nearest million:

		Millions of dollars
1.	New York	146
2.	Pennsylvania	117
3.	Illinois	60
4.	Washington	59
5.	Ohio	56
6.	California	41
7.	Massachusetts	40
8.	New Jersey	32
9.	Nebraska	30
10.	Connecticut	26
11.	Wisconsin	26
12.	Texas	23
13.	Oregon	23
14.	Michigan	17
15.	Virginia	16
16.	Minnesota	16
17.	Missouri	15
18.	Maryland	14
19.	North Carolina	13
20.	Mississippi	12
21.	Iowa	10
22.	Louisiana	10
23.	Oklahoma	10

No data is available to show how many counties have budgets in excess of $10,000,000, but the five counties of New York City have a combined budget of over this amount, while Cook County, Ill., has a budget of over $12,000,000.

The writer believes that the money appropriated for the Navy is well invested, that the taxpayer contributes but a small part of his taxes to the Navy, and that this amount could not be materially reduced. Further, it seems certain that millions of dollars could easily be saved by cutting city, township, county, and state expenses. This is where the cuts should be made to relieve the taxpayers of this so-called "crushing load of taxation."

Sincerely, yours,

L. M. OVERSTREET,
Captain, United States Navy

HON. MELVIN MCLAUGHLIN, M. C.,
House of Representatives, Washington, D. C.—Congressional Record.

THE MERCHANT MARINE.—The following letter and statement were inserted in the *Congressional Record* at the request of the Hon. Wesley L. Jones of Washington, and are reprinted in part only.

United States Shipping Board,
Washington, June 26, 1922.

Hon. Wesley L. Jones,
United States Senate, Washington, D. C.

My Dear Senator: The President in his message to the Congress has covered the need of a merchant marine as a national necessity for peace and war. He has asked that during the recess of the House Members illumine their constituents on the administration's proposed bill for Government aid to shipping.

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In considering the pending legislation it would seem to the writer that final determination need not be dependent on whether one feels that the United States needs a merchant marine, the fact is that the Shipping Board is today in possession of the greatest fleet the world has ever known and which by act of Congress it is mandated to operate on essential trade routes until such time as its vessels can be sold to private owners. That is the situation we are faced with.

The Shipping Board admits that it can not operate its fleet remotely as economically as private owners operate their vessels; the history of the prior boards show that they were unable to put the operation of the Government fleet on a proper business basis. The Shipping Board believes that the fleet under its charge can never be profitably or successfully operated under Government control because of the inherent and insurmountable handicaps incident to the Government ownership of ships. The reasons for these conclusions are elaborately covered in the statement inclosed.

Thus the question to be considered is, What shall we now do with this war inheritance? Shall it be sold to private ownership for operation under the American flag; shall it be sold abroad, possibly some day to rise and plague us; or shall it be junked and charged off to war cost as powder and shell were charged off?

The Shipping Board, approaching the problem as a business problem, believes that few Americans would advocate junking a fleet which cost the Nation vast sums of money. That alternative is dismissed as impracticable and impossible—impossible because such a course would admit to the world that the United States, possessed of a great fleet of merchant ships, was forced to concede that it lacked the ingenuity and ability to convert that fleet to a revenue-getting profitable asset comparable to the merchant fleets responsible for the commercial success of other great nations, and that the United States was bankrupt in statesmanship that visualized the need of keeping alive a merchant marine under its flag for peace and war protection.

The Shipping Board does not believe that the desirable units of America's fleet should be sold abroad, not only because such a course would end for decades any hope of establishing the American flag on the seas, but because it would place in the hands of our commercial rivals added tools to control world trade, would strengthen in certain ways the naval powers of other countries and weaken our own, and would allow citizens of other nations to select the cream of our tonnage at their own prices while the United States paid the great cost of upkeep of the inferior ships left on our hands.

The Shipping Board composed of four Republicans and three Democrats, advised to-day by as competent a staff of experts as possibly any Government organization has ever brought together, averring unanimously that its efforts and the efforts of prior boards have proved that Government operation of ships is an utter impracticability, leaves us as an alternative the attempt to get the Government-owned ships into private hands for operation under private American control.

The administration has a bill now in Congress which the board believes will not only accomplish the establishment of a successfully privately owned American merchant marine but will accomplish it at an actual and substantial saving of money to the taxpayers by substituting profitable private ownership for Government operation that is and has been an unending and almost unmeasured drain on the overburdened taxpayer.

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The Government came into possession of this vast fleet through war necessity. The fleet was built hurriedly, without regard to the costs of peace-time operation and without regard to the peculiar necessities of peace-time trade. The result is that we have many ships whose design and machinery will never permit of profitable commercial operation; we have far too many ships of some types, in some cases too many even of the right type; we have not nearly enough passenger ships, passenger-and-cargo ships, and refrigerator ships to constitute a balanced merchant marine for peace purposes or for naval uses in time of war.

There can be no thought of naval equality with Great Britain unless we have as many merchant ships of the proper types suitable for naval auxiliary use as has Great Britain. Fast passenger ships for raider and communication purposes, refrigerator ships to supply the combatant fleet, and airplane-carrying ships to scout for the fleet are almost as necessary to the operations of the Navy in time of war as are naval vessels themselves. In the most valuable types of ships for naval operations Great Britain already has approximately 250 to this country's 50, and when type and speed are considered Great Britain's advantage is even more overwhelming.

The war has changed the United States from a debtor to a creditor Nation. Our sea carrying before the war was almost entirely performed by the nations to whom we owed money. Those nations now owe us. They must try to utilize every advantage in the markets of the world in order to increase their prosperity, and we, with greatly increased productive capacity because of the war, and facing overproduction in the future, must expand our foreign trade, if we are to market our surpluses. Ships are as essential to foreign trade as are goods.

It is not to be supposed that those nations who will be our competitors for the trade of the world will always give us the ships we need when and as we need them. Regularity of sailing and promptness of service is the very life of foreign trade. Inability to market our surplus because of lack of ocean-carrying capacity will inevitably mean depression at home.

The farmer is vitally interested in the merchant marine in many ways. It is probable that the great carrying nations of the world, owing us large sums of money, may attempt, so far as they can, to buy their agricultural needs elsewhere. We must insure under our own flag such speed and prompt delivery to their shores of our agricultural products as will force them to buy from us.

While ocean freight rates were high immediately after the war they would have been higher but for the existence of the American merchant marine. If that merchant marine is permitted to die, a great toll in excessive ocean freight rates may be collected from us by the foreigner.

Unless we have ships of our own to insure our export trade the excess production of farm and mine and factory will constitute a surplus result-

ing in nonemployment in this country that can not but seriously affect the farmer's ability to market his product at profitable prices in the United States. Furthermore, the farmer's demand for adequate inland waterways, as evidenced in the Great Lakes-St. Lawrence Canal and Mississippi River deep-waterway projects, demonstrates the farmer's recognition of the importance of adequate water-carriage facilities to his needs. If and when these waterways are perfected the best insurance of their continued use would be a merchant marine under the American flag.

The United States, once one of the proudest Nations on the sea, has had no merchant marine worthy of the name since the Civil War. The present Government-owned fleet offers the nucleus of a merchant marine commensurate with the position of the United States in the firmament of nations. Realizing the inefficiencies and great cost of Government operation; having demonstrated the impossibility of selling the ships to private American owners under existing conditions, and being well aware of the great differentials faced by American steamship operators as against the shipping men of other nations, the Shipping Board, a bipartisan organization, has unanimously and without political difference among its members recommended a policy of aids to shipping that has become the basis of the administration's proposal to Congress.

That proposal contemplates that should America ultimately get the 7,500,000 gross tons necessary to carry half of our overseas commerce the cost to the Treasury, directly and indirectly, would be something like $40,000,000 per annum. The 400 ships the Government is now operating at a cost of $50,000,000 a year would, under the proposed measure, draw but slightly more than $8,000,000 Government aid.

The administration's proposal limits the profits of any fleet receiving the benefits of Government aid to 10 per cent in any one year, each year standing by itself. There is no guaranty of profit. If a ship after receiving aid loses money that loss is the owner's. If it makes money all over 10 per cent is divided; half going to the Government until all aid advanced to the vessel has been repaid. There can be no possibility of profiteering.

It is believed that the administration's measure will be a money-making proposition for the Treasury. If the bill is adopted and becomes law there will be more money in the Treasury at the end of a few years than would be in the Treasury if the bill is not adopted.

With sufficient Government aid, direct and indirect, to overcome the advantages which other nations have long enjoyed on the seas, private capital will it is confidently felt be attracted into shipping. The Treasury cost, in direct and indirect aids, the first year, if the bill passes, can not possibly be more than $15,000,000.

If at all successful, gradually (and it is hoped by the end of two and one-half years from the passage of the bill) the Government's $50,000,000 annual loss in operation through the Shipping Board will be wiped out. Under any conditions there would always be a substantial difference in favor of the Treasury between the maximum subsidy cost and the cost under Government operation.

The ships are wearing out and still America is impotent on the seas from a merchant marine point of view as compared with other nations. The fleet is bringing nothing into the Treasury and is costing large sums annually. If the ships are sold the proceeds will go into the Treasury to liquidate in some part of their war-time cost. Thus the measure proposed by the administration should accomplish the liquidation of that part of the fleet serviceable under the American flag; it will end the drain on the Treasury resulting from Government operation; it will end the discouragement to private initiative resulting from that operation, and will stimulate Americans to take their proper places in the

ocean-carrying competition of the world; it will insure the building of types of ships necessary not only to America's prosperity but to her preservation in time of need, and it will keep alive the art of shipbuilding in America, now threatened with extinction.

Respectfully,
A. D. LASKER.

What Are We to do with Our Government-Owned Ships?—Do We Need a Merchant Marine for Peace and War?

[Statement by Albert D. Lasker, chairman United States Shipping Board, at the joint hearing before the Senate Committee on Commerce and the House Committee on Merchant Marine and Fisheries on the proposed bill providing aids for American shipping.]

Whether or no America is to be potent on the seas for the next several generations will be decided in the disposition by Congress of the legislation now proposed by the President for the aid and upbuilding of our merchant marine.

The Question at Issue

The matter under consideration is not merely one of subsidy or no subsidy; it involves what shall become of the Government's vast war-built merchant fleet; what shall be done to end the large losses of governmental operation of ships through the Emergency Fleet Corporation; what shall be done to insure the overseas carriage of America's surplus products in times of peace; and it involves, in importance possibly beyond all these questions, whether America, through the possession of an adequate merchant marine, shall be self-sustaining and self-sufficient on the seas in times of war.

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Changes Wrought by the World War

The World War has changed practically every phase of human life. America emerges from that war holding first economic place in the world. She finds herself a creditor nation instead of a debtor nation; and whether we will it or no, we are now cast for continuing first place on the stage of world commerce. No nation ever held that proud position unless she was strong in her own rights on the seas. It is for us here and now to determine whether America shall attempt to refuse the place which destiny has carved out for her.

When Europe awoke that summer morning in 1914 to find herself enmeshed in a World War it was the beginning of a demand for American exports such as the wildest dreams of our greatest empire builders never visioned. That part of the world to whom the seas were still free centered its efforts to send its ships to our shores that they might be laden with the products of our factories, farms, and mines. We ourselves could make but a pitiful showing in the exportation of our own goods under our own flag. And were it not that the maximum production we could give did not even approximate the minimum of Europe's needs we should have been in a sorry plight; for had the war been lesser in area, and therefore the demands of combatants not required all the output we could supply, our great production would not have been used. We could not have had the ships to send our surplus wares to neutrals; and if one of the great maritime nations, say Britain, had solely engaged in a smaller war confined to a narrower but distant area, her ships would have been diverted to her own uses.

Costly Lesson of Boer War

This is exemplified through the Boer War, where the conduct of operations was at a great distance from their base. Britain's ships were needed for long carriage of men and supplies, though not in quantities remotely comparable to the World War. Thus, while Britain did not have pressing need for our production, she had such need of her own ships for the long haul that we were sorely pressed for carriage in our trade with her and other nations, as was evidenced by depression in many of our important commodities. Had we at that time had the expanded factory capacity we now have, the diversion of England's tonnage from our peace needs to her war needs would have been a calamity indeed. As it was, we all remember the serious effect this diversion of British tonnage had on the marketing of our farm products; it demonstrated that the farmer, even more than the manufacturer, was interested in America's controlling her own tonnage. Unfortunately, these lessons, because only transient, are soon forgotten.

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Government Operations Fatal to Private Initiative

Thus we find ourselves to-day with the Government owning 1,442 steel ships aggregating 7,000,000 gross tons, operating 421 of these ships at an estimated cost to the Treasury the coming year of $50,000,000, with 1,021 ships tied up; we find private operations as well being conducted at startling losses, due not only to depressed world conditions but to the impossibility of the private owner maintaining himself in the face of continued Government competition.

The purpose of Government operation as defined by law, was to build up trade routes in order that the Government ships might thus be sold with established good will to private owners. The very method chosen has worked to defeat its own purpose, for in the upbuilding of those routes the Government has operated ships, and in the operation of ships has driven its potential customers largely off the seas. Thus we come to conclusions from which there can be no escape—that since continued Government operations means finally the possible and likely elimination of private operation of American ships a method must be devised whereby the Government shall end its operation and at the same time insure carriage of American goods under the American flag through private ownership as contemplated by the Jones Act.

Must Be Independent on the Seas

We no longer can be disinterested in whether or no we shall have an established American merchant marine. The transition from debtor nation to creditor nation has settled that; the changing needs of our people in imports and changing demands of others in exports all emphasize that we have no assured future of prosperity if we rely on other than ourselves to carry our overseas trade.

Europe owes us, governmentally and privately, some $15,000,000,000. To pay in gold is impossible; there is not that much gold in the world. The only way Europe can pay (to such extent as she may pay) will be in goods, either raw materials or manufactured or partly manufactured wares. In turn, we must find new markets, not only to absorb the surplus products which Europe formerly took from us, but to provide for the sale of many of the products which Europe shall send to us in settlement of her debt. These products, if in raw or partly manufactured state, will be brought to completed processes by American labor; but if we do not find a foreign sale for them, will so depress the price of wares at home as to threaten the prosperity of all of our workers.

These newer markets lie across the ocean—to the south in the Western Hemisphere, to the east in China and Siberia. It is the very need of trade in these markets that is the inspiration of the policy of the open door in the Far East, which means nothing more or less than free opportunity, based on merit, for exchange of wares.

Ships Essential to Foreign Trade Expansion

It is for these very markets that the nations of Europe which owe us vast sums of money will contend with us. And who can be so blind as not to see that Europe will very properly in her own interest find the way and means to refuse us ships when we need them most if that refusal spells her control of markets in which we would compete with her for mastery. It is well enough to say that she will not refuse us the ships if we can pay higher freights, but who supposes that foreign governments will not be sufficiently ingenious to work out plans to control their own ships to benefit their national trade and to our disadvantages even by so doing they bring into their national treasuries possibly lesser freights than we would pay? If a ship in freight receipts could get only $25,000 in Europe and $35,000 here to carry a cargo to the same trade worth $1,000,000, the wise governments of Europe will find ways to equalize the loss in freight receipts to their own carriers; that their national treasuries may be enriched by the sale of the million-dollar cargoes rather than permit us to get those benefits, even though we would pay $10,000 more for the carriage.

America Once Supreme on Seas

In our early days we were a seafaring nation. Our clipper ships excelled the world. With an undeveloped empire to exploit, the spirit of our youth, both from the standpoint of adventure and profit, responded to the inland call. Self-sufficient, self-contained, with abundant natural wealth to the point of waste, we became indifferent to the sea until shortly after the Civil War those nations who had the greatest need of the sea had so manipulated it that America became, other than coastwise, practically a nonmaritime nation. The great World War brought about an increase in our production capacity that defied all preconceived ideas of expansion.

There can be no return to a pre-war basis. Increased overheads through increased capacities demand increased consumption in many lines beyond that which can be found in our home country. The debts Europe owes us, their enforced economy for decades to come, and consequently finally diminishing purchases from us, all combine to require our search for new markets. These markets will inure to us only when sureness of delivery, regularity of sailing, and promptness of service from our ports to theirs is guaranteed. Promptness and regularity are the very essence of foreign commerce. The greatest agents of our foreign commerce are ships of our own flag that must fight for cargoes from and to our shores to insure their profitable operation. The semideveloped countries of Europe, the newer countries which are not self-sufficient in their own rights, will be a fighting ground for trade. And here, too, only through control of our own ships can we be insured of steady markets.

Foreign Trade Now Essential to Entire Country

Aside from all this is our own change in domestic needs. Through our great prosperity we have become, compared to the other nations of the world, a luxury-loving nation. Coffee, almost unknown as a regular beverage in most other countries, is a several times a day necessity at our national table. Three-quarters or more of all the automobiles in the

world are run in America. Their tires alone require untold quantities of rubber. All these luxuries which we import must be paid by exports, and we must insure that these exports shall reach their destination when and as needed.

The freights alone involved in our expanding commerce mount into the hundreds of millions, and it means much to our national wealth whether we retain those freights collectively to ourselves or whether we pay them abroad. If John Smith, the individual, spends $50 abroad and receives therefor wares, he is none the poorer; but if the national John Smith spends $50,000,000 abroad that he could retain at home, the Nation is a great portion of that $50,000,000 poorer.

Farmer Vitally Interested in Export Trade

The farmer has but recently seen what it means to him, in depression in price of his entire production, when exports fail and the surplus of his production backs up at home. We have but lately seen how our Government's expenditure of $20,000,000 plus twelve millions from the Soviet government, for grains to starving Russia marked the beginning of an uprise in price of all our cereal products. From the very time that these purchases began the price of wheat and corn and oats rose. It is not contended that these purchases alone were responsible for the uprise, but they were one of the several factors that resulted in the farmers' depression being alleviated.

Had it not been for the Government's possession of its present steel fleet these export foods could not have been promptly transported, for there was not immediately available in commission adequate private tonnage. No one has a greater interest in an established American merchant marine than the farmer of our country, because it is in the sale of his surpluses abroad that his entire prosperity is involved. Europe, owing us vast sums, will undertake to make its purchases of surplus grains, when it can, in countries other than our own; and it is only through the control of our own deliveries, insuring that they be expeditious and constant, that we can hope to maintain prosperity for our agriculture.

Great Lakes–St. Lawrence Project

The farmers of our 18 chief agricultural states, with a total population of 40,000,000, are making a demand to which an affirmative response seems certain—that the ocean be brought nearer to them by the building of the St. Lawrence waterway, a conception that our Middle States will refuse to surrender until it becomes a reality. There can be no certainty of even a fair trial of that project after it is built unless we can have profitable operation of American ships, because the carriage in that waterway, which it is my ardent hope will soon be constructed, is but seasonable, and other nations might not afford to work out a system of flexibility of tonnage for use in that waterway to our advantage. Assured flexibility for use of that project must come from us and us alone. Therefore, when the farmers' dream of the St. Lawrence waterway comes true, as come true it will, it can have no assured life without an American merchant marine, and that merchant marine should be well established before the canal becomes a reality, that companies of sufficient strength may be alive to take advantage of its opening.

For all these reasons, therefore, in the changed condition of man and time, the economic need of our country demands an American merchant marine if we are to insure the prosperity of future generations on the farm, in the mine, and in the factory, which prosperity can only be insured through world markets for our surpluses—markets protected by American ships carrying American wares.

Merchant Ships Essential as Naval Auxiliary

We have lately seen the close of a great conference here in Washington whereby it is proposed to limit the burden of expenditure for naval armament on the sorely taxed peoples of the world. Our own America, the most prosperous of all the nations, is herself groaning under naval expense. It is because of a revulsion from increased naval armaments, as well as a cry for release from taxation, that the nations of the world agreed on a basis of limitation. Coupled with that are the treaties of the Far East involving the open door in China, which means free opportunity for trade in China. Nations build navies to insure that their merchant ships may carry their wares to all portions of the world unmolested. And so the limitations on our navy and the open door in China, both integrally, are part of our national economic policies. Trade and trade alone are the factors that center world interest in the Far East. The naval needs are to protect that trade.

United States Navy Once Impotent Without Foreign Ship Aid

Having agreed to a naval program of 5-5-3, we can have no thought or hope of actual naval equality unless we can supply and bunker our navy through our own merchant ships in time of war, should that unhappily come again. When President Roosevelt sent our navy around the world, it had to be supplied and bunkered by foreign-flag ships. Our naval giant showed the nations of the world its feet of clay. In 1914, when the World War began, be it said to the shame of America, she possessed but 15 passenger ships of such type as to be of use for naval auxiliary, while Great Britain possessed over 200 such ships. Today we possess 50 to Great Britain's 250. But when age and speed, which are the determining forces in the use of such ships for naval purposes, are considered, Great Britain's margin over us is further increased.

Our Deficiency in Case of War

Should we unhappily go to war with another country, Great Britain not being a party to the controversy because strict neutrality would be to her interest, we would find it difficult indeed to furnish our Navy with the supply and the fuel ships that it needs, in addition to the convertible type of merchant ship recognized as necessary for the second line of defense. For, while we possess a vast tonnage, that tonnage was built during the war in the best ways immediately possible, in order to get maximum production, but without regard to type or balance; so that while in millions of tons we have a formidable array, in the balancing of our tonnage for either war or peace-time purposes we are sorely deficient. There can be no thought of naval equality with Great Britain until we possess a merchant marine in balance and tonnage equal to hers as a second line of defense to our navy and as a source of supply and fuel. It is idle to say that the 5-5-3 agreement brings us in proportionate naval equality with the other two nations involved, unless we do that which is necessary to build up a merchant marine of proportionate size and balance to theirs; for all naval authority in the world affirms that the supplemental merchant marine required by a navy is as essential to its operation as capital ships themselves.

Falling Short of Allotted Naval Ratio

There can be no thought of our maintaining even the naval tonnage allotted to us by the limitations agreement if we are to have no great auxiliary merchant marine. Great Britain has to-day that adequate merchant marine necessary for any operation of the naval tonnage that accrues to her in the Washington agreement. To the extent that we fail to supply ourselves with an adequate merchant marine of the type and

number to balance the naval strength allotted to us in the Washington conference we should do away with the maintenance of capital naval ships. We can not fool ourselves; we only are on a 5-5-3 naval basis with Great Britain and Japan to the extent that we possess on a 5-5-3 basis merchant marine of the type and kind necessary for naval aid.

As it stands today Great Britain will immediately take her place both with naval and auxiliary merchant ships in the 5-5-3 program. We can not take ours to-day, nor for years to come. We still must create many essential types of merchant ships.

When we use Great Britain as an example we do so in the spirit of the greatest friendship, for, happily, no one can ever have a thought of war between the two greatest English-speaking nations; but rather we use her as an example, because Britain, in her attitude in the late conference, showed that she was as desirous as we that America should have naval equality with her, and she knows, better than we, that there can be no naval equality without the proper merchant marine.

Present Fleet Costly War Inheritance

We came into the possession of the vast fleet we own, built under the hysteria of war, for the carriage of supplies of our army and the navy stores. For the carriage of our men we had to rely chiefly on our allies and on seized enemy tonnage. We all realize now that this war-built tonnage, inadequate for peace or war, could have been built to serve a wider and surer purpose at infinitely less expense if created during times of peace. Shall we again be involved in such haste and loss by failing to learn the lesson which has just been taught us? Wherefore, whether we view it from the standpoint of peace or the needs of war, America must develop its merchant marine.

The Jones Act wisely provides, in its preamble, that its purpose is to develop a merchant marine as an aid to the army and navy in war and for the development of American trade in times of peace. We are not able to accomplish these purposes at the present time. Startling as it may seem, in spite of the vast tonnage we possess, we are not now positioned to protect our peace-time trade or to properly care for our army and navy in times of war.

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Government Operation Expensive and Unsuccessful

The Shipping Board, under mandate of the Jones Act to maintain necessary trade routes, is operating 421 ships at an annual loss of approximately $50,000,000. This includes the cost of lay-up, but not the cost of all necessary repairs, though the board is doing such repairs as it can within the figure named. There should be no quarrel at this expenditure of $50,000,000, because thereby we are keeping the American flag flying into all ports of the world, and the American manufacturer and producer is assured of carriage for his wares to his markets when his needs demand. For the year 1921, America carried under her own flag 51 per cent of her total foreign trade. This figure seems to indicate a result much more favorable than the real facts warrant.

If we deduct from our foreign water-borne trade that which is carried on the Great Lakes, in vessels which for the present are immured there, and if we subtract the cargoes carried between this country and the countries bordering on the Caribbean which have no merchant marines of their own and whose trade, therefore, is not competitive, there will remain the traffic in general cargo to overseas continents and nations having merchant fleets and competing with us for these particular cargoes.

Our Standing in Competitive Sea Carriage

In this figure, which represents our real competitive trade, the American ship makes a poor showing. Our exports in this trade are now three and one-half times our imports. Of these exports, foreign ships carried over the entire year an average of 71 per cent, while the American ship carried but 29 per cent, and only reached this figure by virtue of the large amount of coal exported in American ships during the British coal strike.

For December, which represents a recent normal month, foreign ships carried 76 per cent of our overseas general cargoes and 24 per cent was left to be carried in American ships. This 24 per cent measured our success in competing against foreign nations for the carriage of our products to the markets of the world. Of the 24 per cent 19 per cent was carried in Shipping Board vessels and 5 per cent by private American owners.

Must Carry Half Our Own Ocean Trade

It must be the purpose and the aim of America—and the Shipping Board emphasizes its belief that this aim can be accomplished—to carry at least 50 per cent of our foreign trade, other than with contiguous and nearby countries, under the American flag privately operated. The suggestions made to the Congress by the President contemplate within a decade, at the cost estimated by him, that 50 per cent of such trade will be carried under the American flag privately operated. We are to-day carrying 87 per cent of our oil trade with Mexico and 57 per cent of the Caribbean trade in our own ships. But neither the needs of trade with Mexico nor the Caribbean calls for that type of ship which is the very backbone of the second line of defense of our navy; nor does the trade with Mexico or the Caribbean call for that type of ship which is the forerunner of world trade and world intercourse—the fast passenger and combination passenger and cargo ships.

Of the 24 per cent of world carriage in American bottoms here referred to, it is appalling to think that 19 per cent is carried in Government-owned ships and only 5 per cent in privately owned ships, when it is considered that the Government through the Shipping Board, admits its inability to operate on an equally efficient basis in competition with the private ships of the world. Fifty million dollars annually it is costing to keep the Shipping Board boats going—$50,000,000, not including, however, interest, full insurance, or depreciation on invested capital. For any private business to say that it was losing $50,000,000, without considering interest on capital investment, full insurance, or depreciation, would mean that the managers of that private business were attempting to deceive their stockholders by understatement. In the same way it is a deception to the American people to represent that the Shipping Board is losing but $50,000,000 per annum, when that $50,000,000 is lost in operations only and does not consider capital invested.

Where Emergency Fleet Has Already Paid for Itself

There was, however, good reason why the Government at the end of the war should through the Shipping Board have established governmental operation. Not only should there be no apology for this, the facts warranted it, and the time will come when it will prove to have been an act of courage and vision on the part of our people. But the continuance of this Government operation is now as unforgivable as its establishment was sound.

What do we mean by this seeming contradiction? When the World War was over there was a great scramble on the part of all the maritime nations to use their own tonnage for their own peace-time needs

Had America not possessed the tonnage she built during the war, in thé two years of prosperity that followed the war we would have lost largely of markets that were ours, much as their need would have been for our wares, because there would not have been tonnage available to carry our goods. Those who needed them would have sent us their ships to the extent that they needed goods, but even then many would not have had enough ships to carry that which they alone needed, and others would not have furnished us their surplus ships for our trade aggrandizement at their own expense.

Government Postwar Operation Necessary

The vast sums we saved to ourselves in freights alone, which through faulty governmental bookkeeping, was converted to construction charges, would have shown during that period that handsome freight returns inured to the Public Treasury. Private operation at that time would have been impossible; there had been but little overseas carriage under the American flag by private owners before the war, and private capital therefore would not have been available at the war's conclusion quickly enough to operate successfully the Government-owned ships, even had the Government sold those ships at fair prices to private owners. So that, in order that the war-built fleet might immediately come into America's peace-time needs, the Government was forced into operation—an operation that from that time to this, through the lack of private facilities, has been the greatest insurance we have to our future overseas prosperity, which involves our entire national prosperity.

Government Operation Inherently Vicious

We believe that the present operation by the Shipping Board is fast approaching as efficient an operation as government can give. But any free competition with the privately owned shipping of the world, through successful Government operation, the Shipping Board avers is an impossibility. The restrictions of congressional legislation, the demands of varying sections of the country, the limitations on free play, from which private business does not suffer, make it impossible for government-owned shipping to compete with the private ships of the world.

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Government Operation Means Eventual Disappearance of Fleet

One of the most formidable objections to continued Government operation to-day—an objection that is insurmountable—is that the ships owned by the Government would in due course wear out, even with proper repairs. No one in Congress suggests, nor have I ever heard it suggested from any source, that the Government should build ships to replace those that are worn out, or that the Government should build new type ships. If there is one unanimous opinion in the country regarding our mechant marine it is that Government construction of merchant ships should cease. Thus the continued operation by the Government of its present fleet would be making no progress toward a permanent policy on the seas or a renewed and enduring merchant marine. This one phase alone calls for legislation along the lines proposed to insure the Government's retirement from ownership and operation.

Permit me to stress that unless the Government rebuilds, even if the Government could stay in operation and give a good operation, which I deny, within less than 20 years the fleet would be worn out and gone. We would be building up no American merchant marine, for, with the Government continuing to operate, private operators would be driven out of business under the American flag. They could not stand the competition. The Government would not be building

new ships, and all that would have been accomplished would be declining Governmental operations under the American flag, with the assurance that the ultimate would be America driven from the seas. Thus the Americans who took to the sea as a profession would ultimately find America without ships of its own flag, and would be driven to ship on foreign ships at foreign wages; whereas by insuring private operations, which will be continuing, we insure American seamen on the sea at American wages. Further, if the Government continues in operation without the legislation asked for, and drives the private owner off the sea or prevents his growth and assuredly prevents new capital from coming into existence, there will be no building by the Government, or anyone else under the American flag, of those types of ships so sorely needed to balance our fleet and to aid our Navy in time of war.

Continued Government operation is a solution only from one standpoint. It solves the problem in one way, to wit, that the fleet shall be operated by the Government until it is worn out and thus assure the elimination of the American flag from world commerce.

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Fast Losing Art of Shipbuilding

With the limitations of armament and the holiday in naval shipbuilding, the development of the private shipyard becomes more essential than ever, or the art of shipbuilding will be lost to America, and in time of war those nations of the world who kept their shipbuilding alive through overseas carrying will have an unmatchable advantage against us. So, with changed conditions from the standpoint of our country's security alone, it is essential that we foster a private merchant marine built by American workmen.

Therefore, with higher costs of living and with higher capital charges, if we grant that for war and peace time purposes we need a merchant marine, the Government must, through aid to shipping, direct or indirect, or both, make good the difference between these added charges under the American and other flags. And further, only through aid to private shipping can we hope to end the great loss through governmental operation now existing and liquidate the Government's fleet.

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Sinister Forces at Work Covertly

We hold no quarrel with the foreigner, who would do all he can to prevent the establishment of an American merchant marine, that the profit of our carriage might inure to him. But we ask that there at least be a public understanding of the sinister forces that are at work—forces that can not be measured, that can not be detected, that can not be cornered—who use their instruments subtly among honest men. The day has come when we must in common understanding, approach this subject. Happily, the Shipping Board, after long and careful study, came to the conclusion that a proper measure of Government aid to accomplish the purposes in mind could only come through the use of both direct and indirect aids, throwing the burden on to the indirect aid.

Combination of Both Methods in Proposed Legislation

Under the chairmanship of Commissioner Lissner, in conjunction with the chairman of the Shipping Board, and aided by an ample staff of experts, the Shipping Board made a study of all forms of indirect and direct aids ascertainable. A plan has been worked out whereby a very sound system of indirect aids is proposed. It is proposed in addition to give direct aid to a sufficient extent to make possible in good years earnings of 10 per cent or more for ships—surely not a

very large earning where capital has to be attracted in competition with other enterprises. Beyond 10 per cent the earnings will be divided equally between the owner and the Government until all of the direct aid shall have been paid back into the merchant-marine fund to be created for the aid of shipping, after which the ships retain all of the surplus earnings, if any. If the indirect aids proposed should be sufficient in any annual period to bring proper returns, there would be no direct aid retained. Thus the burden of the aid is thrown on the indirect.

All Possible Indirect Aids Recommended

Thus the proponent of indirect aids can have no occasion to quarrel with the proposals; for, as the Shipping Board recommends every practical indirect aid possible to give, if those indirect aids should not be sufficient, no one can question that the Government should, from its Treasury, if ships are a national necessity, if the Government's loss in operation is to be ended and its fleet sold, help to the extent of making possible earnings of 10 per cent in good years. The proponents of direct aid certainly can raise no objection to indirect aids being first called into being, reliance being placed on direct aids only if the indirect aids are not sufficient. Therefore, in the legislation proposed by the President to the Congress through the Shipping Board's study, there can be no quarrel between the two schools of Government aid.

No Opportunity for Profiteering

This legislation proposes a very proper profit limitation—10 per cent on the earnings of ships, and after that equal divisions of earnings between the owner and the merchant marine fund until the subsidy is returned. Surely such an allowance of earnings can not be called profiteering, because, while the ships are allowed a net profit of 10 per cent before beginning to return the subsidy, and thereafter are allowed half the net profit until the entire amount of the subsidy is returned, nowhere in the Shipping Board study is it proposed that ships be protected against loss. Under the proposal made, including the right of the Shipping Board to make 10-year contracts, there will be many years during which, with all the aids given, ships will lose money; and it is universally conceded that in the shipping business, through the years of plenty and years of famine, the average that any ship can earn through the proposed Government aid during the term of its 10-year contract is a very modest sum.

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Construction Loan Fund

Section 11 of the present Jones Act provides that for a term of five years the Shipping Board may recover into a construction loan fund $25,000,000 annually, or a total of $125,000,000. Thus far the Shipping Board, like the horse that eats its head off, has used all the money for operation and construction that have come to it from liquidation, and there is nothing in the loan fund. The board, however, hopes with proposed appropriations soon to be made available, to have its debts liquidated at no late date, and asks that it be permitted out of further liquidation to accrue to the construction loan fund as expeditiously as possible the $125,000,000, and begs permission to loan this at rates as low as 2 per cent.

Great Cunarders Virtually Gift

Great Britain, feeling a commercial and naval need for the *Mauretania* and *Lusitania*, built these ships for the Cunard line at an interest charge of 2¾ per cent. However, Britain furnished all the money, gave them 20 years to pay it off, and gave the company an annual subsidy that equaled the amount of interest and amortization to be paid. So

that in effect, the British Government made the Cunard Co. a present of the ships. Nothing so drastic is proposed by the Shipping Board.

Owner Must Do His Part

We propose at most to loan two-thirds of the value of the ships; the balance must be furnished by the owner. The low interest rate will be given only for special types of ships that will be considered essential for the building of a balanced merchant marine for peace and war time purposes, and will be measured with a view to equalizing capital costs. Again, the limitation of profit comes into play; because, if the lower interest rate results in increased earnings at above 10 per cent, half of those increased earnings come back into the merchant marine fund until the subsidy received is paid back in any one year. If the earnings should not be 10 per cent it will be proved that the Government wisely loaned the money at 2 per cent to insure that these types of ships, which are as needed as warships themselves, be built. It is this construction loan fund that is our greatest insurance for continued operation of private shipyards in America.

Income Tax Relief

Another form of indirect aids proposed is in income tax relief. In order to create an incentive for shippers to use American-flag ships and as a stimulus to our foreign trade, a deduction from net Federal income tax payable should be allowed on the basis of 5 per cent of the freight paid on goods imported or exported in American-flag vessels. This deduction in time might amount to eight or ten million dollars per year.

Through co-operation with the Treasury Department and by legislation a greater allowance for depreciation for income-tax purposes should be made on ships in order to make the depreciation allowances more accurately represent the actual depreciation of vessels and to give effect to the marked slump in the value of tonnage during the past several years.

Section 23 of the merchant marine act should be amended so that the payment of all income taxes (which would otherwise be payable on net earnings of vessels in foreign trade) shall be waived by the Government when the amount of such taxes is applied to half the cost of new ship construction—increasing same from one-third as at present.

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Division of Immigration

It is proposed through co-operation with the Bureau of Immigration of the Department of Labor that regulations should be prescribed and legislation enacted that would insure to American-flag passenger ships at least 50 per cent of the immigration coming to this country.

Such regulations shall not go into effect until existing treaties are modified sufficiently to permit. The President is directed to undertake such negotiations as may be necessary, and upon completing such negotiations to proclaim the taking effect of this provision.

Had such a provision been enacted during that pre-war period when immigration was at its height — 1,200,000 per annum—and had half of that number of immigrants come in American-flag ships, the Shipping Board believes that instead of having only 15 passenger ships under the American flag in 1914, in the north Atlantic at least we would have had as many passenger ships of the third-class type as any nation in the world, Great Britain not excepted.

Overlooked Invaluable Immigration Aid

Had we husbanded and used our rights—had we shown the slightest interest in or desire for a merchant marine, without one cent of aid

from the Treasury, through the enactment of an immigration proposal such as here put forth, we had in the flood tide of immigration within our grasp the means of establishing a valuable branch of the merchant marine. Should this proposal work out as the Shipping Board believes it will, the limitation of profits will again come into play, and many of the third-class passenger ships—and better classes of passenger ships for that—will earn over 10 per cent as a result of this immigration legislation. The plus beyond the 10 per cent will be equally divided between the owner and the merchant-marine fund until the subsidy is repaid.

Requires Government Employees to Use American Ships

It is proposed that all Government agents from whatever department who travel abroad make use of American-flag ships. It would appear unseemingly that Congress should have to be petitioned to make such action mandatory by law; but, sad to relate, many if not most of the servants of the Government traveling abroad use the ships of foreign flag, giving oft times as their excuse that they do so as a compliment to the country to which they are going. One has never heard of a foreigner using an American-flag ship as a compliment to us!

To increase the revenues of American vessels and to furnish an example for all American citizens to follow in giving preference to American ships, therefore legislation should be enacted that will prohibit hereafter the overseas transportation of passengers or freight at the expense of the Government other than in a vessel flying the American flag, unless suitable and convenient transportation by an American vessel is not obtainable.

Army Transport Service

Based on current commercial rates and on the volume of passenger and cargo movement for 1921 on trans-Pacific traffic alone, the total charge for transporting Government passengers and cargo by commercial vessels would be approximately, $7,500,000 per annum. There can be no economic justification for the withholding of this business from Shipping Board ships which are available or from privately owned ships. The withdrawal of the army and navy transport services, which the President should be authorized to effect by executive order in whole or in part, will materially reduce the operating losses of the Shipping Board, and should largely aid in the disposal of many of its vessels. It is estimated that during the first year the diversion of this traffic to the trans-Pacific Shipping Board services or to privately owned lines would result in increased net earnings to the Shipping Board or such privately owned lines of approximately $5,000,000. This business would be an impelling inducement to private owners to purchase at a fair valuation the Shipping Board passenger-cargo vessels adapted for this service.

The volume of business afforded to trans-Pacific lines through the army and navy transport service should do much to aid in bringing earnings to 10 per cent, after which half of the earnings will be returned to the merchant-marine fund until the full subsidy is repaid.

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Direct Aid

In its study the Shipping Board has undertaken to make a proposal that shall put American ships on a basis of equality with Great Britain, which has the next highest cost of operation to ours. At no time did we consider aids, direct or indirect, that should do anything for the American owner but place him on a parity with Great Britain. Others will explain to you how we arrive at the basis of direct aid, which may be necessary to take up the slack between the benefits inuring from

the indirect aid proposed, and the amount needed to place costs on a parity with those of Great Britain.

The difference in costs will be not alone that existing at present. Recognizing the imperative need of an American merchant marine in the true sense of the word, the bill provides that no vessel shall receive compensation unless two-thirds or more of her entire crew, exclusive of officers, are American citizens. The officers are required to be citizens by law. The remainder of the crew must be eligible for citizenship, which bars from employment on compensated vessels crews drawn from the so-called Asiatic barred zone. Because of the difficulty of training American citizens to be servants and waiters, the steward's department on passenger ships is exempted from this requirement.

The effect of demanding a fixed proportion of American citizens on board ship and the setting of that proportion at a figure much higher than that which obtains to-day will result in an increased wage differential even beyond that which exists to-day.

Amount of Direct Aid

The direct aid is computed on a differential based on a combination of speed, tonnage, and distance covered, starting with a half cent per gross ton per hundred miles steamed in the foreign trade for ships under 13 knots, and increasing to a total of 2.6 cents per gross ton per hundred miles steamed for ships of 23 knots and over. It is estimated that in order to develop a balanced fleet of 7,500,000 gross tons, which should carry 50 per cent at least of all branches of our overseas trade, the cost to the Treasury will ultimately approximate $30,000,000, though for the first year it is estimated at only $15,000,000.

The details of how this will work out require technical and lengthy illumination, which will later be given you by those who are expert.

Direct Aid Proposed Modest

I wish only to state that from the investigations made by the Shipping Board, we think this sum a very modest one. If it should enable us to soon get the Emergency Fleet Corporation out of operation and save the greater part of the $50,000,000 loss which now burdens the Treasury, the direct aid here proposed should and will more than pay for itself. It is for that reason that we stand firm in the guaranty to Congress that before long the amount paid out in cash subsidy to American ships will be more than equalized by decreased appropriations for the Emergency Fleet Corporation.

It was obviously impossible to compute a basis of Government aid that will be exact. It is no more possible to figure out a system of direct aid for shipping on exact lines than it is possible to enact a tariff bill or a tax bill that will work out with exact justice. When one legislates in the abstract for such vast undertakings, covering differing operations under differing conditions, one can figure at best on the average. But happily in the present proposed legislation, by the limitation on profit in inequalities are equalized in the ultimate.

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National Policy Will Bring New Life

The Shipping Board wishes to emphasize to your committee and to the Congress that world shipping is now more depressed than it has ever been in proportion to world tonnage. Capital is hard to get; operators are timid not only because of the lack of cargoes but because of the uncertainty that hangs over shipping all over the world, through the possible continuous competition in operation of the American Govern-

ment and through the unliquidated tonnage owned by our Government. The greatest stabilizer for world shipping conditions, and particularly for American shipowners and operators, that could come would be the enactment of the legislation proposed by the President that will give a national policy to American shipping, and in behalf of which the Shipping Board is now appearing before you. Courage would immediately come to the American owner, and new life, we believe, would be given to the American investor.

Conclusions

However, so vast an undertaking can not be quickly liquidated. We believe that of the 700 good freight ships we have, the Shipping Board would feel very happy if, within 30 months from the time of the passage of this bill, it could dispose of sufficient ships to take care of the routes it is now operating and put the Emergency Fleet Corporation out of business as an operating company. This, however, the Shipping Board believes is within the realm of promisable accomplishment, and this the Shipping Board believes it can in good faith encourage the Congress to believe will be brought about.

In the human body many organs are vital. Without the heart, the lungs, the liver, the brain, life is not possible. No man can say which is the more vital organ. And so in our national life are many organs vital. Which is the most vital no man can say, but without the possession of any one of the vital organs the Nation can no more live than can the individual. In the development of our national being the merchant marine for peace and war purposes has become a vital organ. Government operation makes that organ a diseased one.

Nation Faces Issue It Can Not Dodge

We are now face to face with the solution of this great national problem. The Shipping Board believes the proposal of the President if adopted by the Congress without major change, will bring to America a healthy organ in a merchant marine, one consonant with our national strength, with our national potentialities, and with our national desires. The salient proposals made are as a mosaic, where each part fits into the other. The Shipping Board stands fast for the general principles covered. But in the application of details, both by law and regulation, the board feels free to say that there may be points that should be further explored and various views that should be considered. Any radical change in the proposals might, however, result in the destruction of the whole.

Urgency of the Situation

For reasons which we have sketched to you, the inefficiencies of the Government operation, the great loss thereby accruing through the continuance of the Emergency Fleet Corporation, the uncertainty in the minds of private owners because of that continued operation, and the need of a policy to insure the disposition of the Government-owned fleet, all testify to the fact that expedition is the essence in the enactment of the legislation for which the President has asked. Delay may be fatal. The Shipping Board would view with alarm inaction by this Congress on the legislation which the President asked in behalf of our merchant marine.

Proposal Nonpartisan—All American

If you accept not our proposal, we join the President in asking that you make a contra one, for, if the status quo remains, we know that as a merchant marine power we shall be bankrupt.

We come before you pleading an all-American question, nonpartisan, with the unanimous recommendation of all the members of our board, Democratic and Republican alike. We come before you to plead that through the enactment of the legislation proposed by the President, America may take its place on the seas as it has won its place on the land. We come before you to plead that an instrument of war be turned into a glorious and profitable instrument of peace, and that we thereby insure to coming generations the heritage which should rightly be theirs.—*Congressional Record*, 27 June, 1922.

HEAVY FUEL COST IS MAIN OPERATING HANDICAP U. S. VESSELS HAVE TO FACE.—Articles recently published in *The Nauticle Gazette* have shown that the high cost of operation of American ships is due more to heavy fuel, upkeep and repair bills than to wages. The high fuel consumption furnishes the item of greatest differential in the operating costs of American and foreign ships and much can be done towards reducing this expense. There are two main reasons why Shipping Board vessels burn more fuel than foreign ships, the first being the poor construction of hulls and machinery, and the second the less efficient manner in which the vessels are handled.

Bows Too Blunt

In the matter of fuel consumption the Board's ships are burdened with an immovable handicap over foreign vessels because of their construction and this handicap can never be entirely overcome by the efficiency of crews. It is woven into the very fabric of the Government's mercantile fleet and in all consideration of competition with foreign ships must be taken into account. The hulls of the Board's ships are too blunt to allow them to make a good speed on an economical fuel consumption, and it often happens that in a head sea the ships will make scarcely any headway despite the amount of fuel that is consumed and the quantity of steam generated. Because of this condition the machinery which should be more efficient than that on foreign vessels because of later design is in reality less effective, and many of the Board's vessels are underpowered.

These factors which result in heavy fuel consumption can be partly removed by competent crews but they can never be entirely overcome and so long as the Board's ships are afloat they must be reckoned with. The other main reason for high fuel bills, however, arises from the human element and it is in this connection that great improvement can be shown. If our ships were handled as efficiently as those under foreign flags the fuel costs would be materially reduced and give our ships a better chance to compete with those of other nations.

In the first place a master should know his vessel thoroughly, but he is rarely on one ship for a long enough period to enable him to understand its peculiarities. One vessel will make a better speed under one trim than she will under another, and the master should be able to have his ship trimmed to the point where she will show the best speed results.

Faulty navigation also adds to the consumption of fuel and this is more common on Government ships than is apparent from the records. For instance, assume a ship is on a course of a thousand miles it frequently happens that poor steering will send her on a zig-zag course. The master takes his position every twenty-four hours and calculates it on the basis of the nearest distance between two points. Therefore he shows a straight course when as a matter of fact the vessel has travelled over a curved course and in the calculation of distances no account is taken of the irregularity. Thus over the course of the thousand miles the ship may actually have travelled twelve or thirteen hundred miles but the extra distance is not shown on the ship's log. Therefore the ship burns more

fuel than is actually necessary to cover the thousand miles and the records of the voyage will naturally show a heavier fuel consumption than they would if the ship kept strictly on her course.

Steering on Alien Ships

On a foreign ship the master is very particular to see that his helmsman keeps the vessel close on her course, but this can only be accomplished by men of wide experience. This better steering is reflected in the fuel consumption of the vessel, and it is in this connection that competent crews can help to reduce the fuel consumption costs on American ships.

Better steering can be accomplished by a more strict observance of the difference between the navigating compass and the steering compass. The steering compass is located in the pilot house and because of the magnetic influences with which it is surrounded it is rarely correct. There is always a difference of several degrees between the steering compass and the navigating compass, the latter being correct. Therefore the difference should be carefully watched and the one checked with the other. On foreign vessels the two compasses are compared at frequent intervals during the day and the difference allowed for in keeping the ship on her course. On American ships, however, this is not done as often as it should be, and by placing sole reliance upon the steering compass the master will find his vessel going out of her course.

Greater attention should be paid to steering, for faulty steering results in high fuel bills. The master of a foreign ship takes pains to watch the wake of the ship and he uses every precaution to see that the ship is kept on her course. If similar care were taken on American ships a substantial reduction in operating costs would be noticed.

In foreign countries shipowners encourage their crews to keep down costs by awarding a bonus for meritorious work in this direction. It is to the master's financial advantage to save money for the owners and he strives in every way to cut down expenses. When the ship's earnings are calculated at the end of the year the bonus is given in accordance with the showing made. In this country, however, the feeling is too prevalent that when a man obtains his master's license he is at the top of the ladder and there is nothing left for him to do. American shipowners should encourage their officers to keep up their studies, and reward them for good work. In this way crews will become efficient and the operating costs of our ships will be reduced to such a degree that they will be able to compete sucessfully with foreigners for a fair share of the world's trade.—*The Nautical Gazette*, 17 June, 1922.

ENGINEERING

TAMED LIGHTNING.—By means of a special apparatus which reproduces actual lightning and is known as a "lightning generator," the laboratory of Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, is making the most successful tests of lightning arresters that have ever been conducted.

The artificial lightning which Dr. Steinmetz and his laboratory co-workers, J. L. R. Hayden and N. A. Lougee, have succeeded in producing for these purposes, has about one five-hundredth of the horsepower possessed by the lightning flash of nature. It has only one five-hundredth as much voltage. But except in the matter of magnitude it is exactly the same sort of energy, stored up and discharged in the same way, as is the gigantic lightning bolt of an electrical storm in the heavens.

Any object that is placed in the path of the artificial lightning stroke is torn to pieces just as truly as it would be if it were in the path of natural

lightning. The laboratory bolt has shattered blocks of wood and small tree branches, scattering them in all directions.

The object is exposed to the lightning by being physically connected to the wiring which is used as the directive path of the man-made lightning. A nail is driven into each end of the wood, and the wires are wound around the nails, so that the block hangs suspended in the circuit through which the lightning will travel.

When lightning arresters are tested by this imitation thunder-storm machine, they are connected up in the same manner, so that the lightning will affect them in the same way that natural lightning would. They are also connected to the lightning circuit of the building, so that they are in effect protecting the lighting circuit against a bolt of laboratory lightning, just as in actual service they would be called upon to guard a transmission line against natural lightning.

Valuable discoveries have been made by this means in the behavior of lightning arresters in service, because by means of the lightning generator, lightning can be duplicated on a small scale at will, and also can be controlled and experimented with. Unusually severe service conditions can be produced, and the action of the lightning arresters can be observed with accuracy. It has been found that the causes for the occasional failure of lightning arresters to function in actual use are far different from what has heretofore been imagined.

In the artificial lightning stroke, a voltage of 120,000 volts was chosen as most convenient. The voltage of the lightning flash of a thunder-storm has been estimated by Dr. Steinmetz at fifty million volts.

The artificial lightning represents, while it lasts, more than a million horsepower. The estimated horsepower of a natural lightning flash is given as 500 million horsepower. The million horsepower of the man-made lightning, like the 500 million horsepower in nature's lightning, would not be very useful for practical purposes, because it lasts such a brief instant. It lasts about a hundred thousandth of a second.

It is true, the natural lightning flash has about 500 times as much horsepower. The difference in energy therefore appears colossal. But the difference in the nature of its action and effects is practically zero. Only, while Nature's lightning shatters and tears a whole tree, the man-made lightning does the same with a piece of a smaller tree.

And yet, according to the laboratory specialists, it is theoretically possible to construct an apparatus which would reproduce Nature's lightning in all its magnitude. It would not be practical to do this, for it would mean apparatus of stupendous size and complexity; and it would not be desirable, as it would not be safe to approach near enough to watch it. But the same applied principle would operate as in the case of the lightning generator now in successful use.

This generator consists essentially of a high voltage condenser of large capacity in the form of 200 large glass plates. These are arranged in groups of fifty and in two banks, or rows. The rectified direct current is stored up in these condensers, which are connected up so as to be capable of holding 120,000 volts.

One end of the double row of condensers corresponds to the thunder-cloud in the sky, in which an electric charge is gradually stored up and increased by the conglomeration of the rain drops, as Dr. Steinmetz has shown. The other end of the condenser plates corresponds to the earth.

When the tension of the stored-up electric energy becomes greater than the lightning generator will hold—and the tension which it will hold is 120,000 volts—or, in the case of natural lightning, becomes greater than the thunder-cloud will hold, whatever the amount of tension may be, the discharge takes place. The lightning flash is seen, the thunder rolls—

represented, in the case of the lightning generator, by a loud snapping sound—and the bolt strikes.

"Higher voltages than we use in this generator have been produced," said Dr. Steinmetz, "and have been talked about as 'lightning.' But mere high voltage is not lightning and has no similarity to lightning in its action and effects. The characteristic of lightning is high voltage backed by large power, lasting for a very short time and so giving explosive effects.

"In the high frequency experiments of Prof. Thomson, Telsa and others, the voltage was very high, but with little power back of it; and even with a million volts, at Pittsfield, the current was a fraction of an ampere. Thus the explosive effects characteristic of lightning were entirely absent.

"In our lightning generator, we get a discharge of ten thousand amperes, at over a hundred thousand volts, that is, a power of over a million horsepower lasting for a hundred thousandth of a second. This gives us the explosive, tearing and shattering effects of real lightning, so that, for instance, a piece of a small tree, exposed to the discharge, is torn to pieces. A piece of wire struck by it vanishes in dust.

"The difference is similar to that between a pound of dynamite and a pint of gasoline; the pint of gasoline contains more energy and can do more work; but the pint of gasoline gives off its energy only slowly, at a moderate rate of power, while the pound of dynamite gives off its energy explosively, all at once, at an enormous rate of power."

The surprising advance of electrical science which these things indicate was pointed out by Dr. Steinmetz.

"When Edison ran his first circuits for electric lighting, in New York City, he used 220 volts. Today we are sending electric power across the country at 220,000 volts. Thus, in 40 years since Edison's first installation, we have increased the voltage in our electric circuits a thousand-fold; we have produced and played with a million volts, and the voltage of the thunder-cloud is only 50 times higher than what man has produced. So, you see, the step from the highest voltage now used to that of lightning is less than was the step which the electrical industry has taken in 40 years."—*Scientific American,* July, 1922.

COMPARATIVE TESTS ON COAL AND OIL BURNING BOILERS.—Recently, comparative tests were made on two small boilers at the National Pipe Bending Co.'s plant in New Haven, Conn., for the purpose of ascertaining the relative cost of generating steam by oil and by coal. The boiler installation at the plant consists of two Bigelow horizontal return-tubular boilers of identical design, each having 1,268 sq.ft. of water-heating surface, the one equipped to burn fuel oil, the other coal (hand-fired).

The results are interesting because they show that in a small plant producing about 4,000 lb. of steam per hour for a period of ten hours daily, oil can be burned as economically as coal. If the load fluctuates considerably, there may be a substantial saving by the use of fuel oil. In the case in question only one boiler is in use at a time. The cost of labor, therefore,

TABLE I. REPORT OF TEST ON BOILER USING FUEL OIL

Number and kind of boilers	One horizontal return-tubular
Water-heating surface, sq. ft.	1,268
Duration of test, hours	7
Steam pressure by gage, lb. per sq. in.	77
Temperature of feed water entering boiler, deg. F.	206
Temperature of escaping gases leaving boiler, deg. F.	492
Force of draft between damper and boiler, in. of water	0.13
Oil fired per hour, lb.	304
Weight of water fed to boiler per hour, lb.	4,000
Equivalent evaporation per hour from and at 212 deg., lb.	4,150
Equivalent evaporation per hour per square foot water heating surface, lb.	3.27
Water fed per pound of oil, lb.	13.1

Equivalent evaporation per pound of oil, lb.	13.6
Calorific value of one pound of oil, B.t.u.	18,520
Efficiency of boiler and furnace, per cent.	71.5
Flue-gas analyses (average), per cent by volume:	
(a) Carbon dioxide *(CO_2)*	9.9
(b) Oxygen *(O_2)*	6.5
(c) Carbon monoxide *(CO)*	0.0

Cost of Steam Generated by Oil

Total steam used for auxiliary purposes incident to operation on oil, lb. per hr.	285
Weight of water fed to boiler, lb. per hr.	4,000
Steam available for other uses, lb. per hr.	3,715
Oil used, lb. per hr.	304
Cost of oil per lb., cents	0.636
Fuel cost of steam available for plant use, including feed-water pump, cents per 1,000 lb.	52.1

does not enter into comparison, because in this particular plant it is possible to combine the functions of the engineer and fireman in one man, whether coal be burned or oil. If the plant were twice as large, so that it became necessary to employ an extra man as fireman when coal was being burned, the saving by burning oil would be greater, for when oil was being burned this extra man could be released and the entire plant cared for by one combined fireman and engineer as before.

Fuel oil is delivered to the plant in tank cars equipped with heating coils. Before the oil can be pumped from these cars, it must be heated for about twelve hours by passing live steam through the coils. At the end of this time the oil is sufficiently fluid to be pumped in the yard storage tank. Here again live steam must be used to keep the oil at a moderate temperature to facilitate pumping the daily supply from the storage tank to a service tank within the power plant. The same pump that empties the tank car into the storage tank also fills the service tank from the storage tank.

A second steam pump, located in the power house, supplies the burner with oil from the service tank. The heat in the exhaust from this pump is utilized to give the fuel a final heating on its way to the burner. The service tank is equipped with heating coils, and a certain amount of steam is used each day in these. Moreover, steam is used by the oil burner to atomize the fuel.

Before a fair comparison of the two boilers could be made, it was necessary to determine how much steam was used for pumping, heating and atomizing the oil. The quantity of steam used by the feed pump does not enter into the comparison, as this is constant for a given load irrespective of what fuel is used.

All the various quantities of steam used for auxiliary purposes when burning oil, were either measured or estimated from the best available data, and from them a figure was obtained that represented the number of pounds of steam for all auxiliaries (except the feed pump) chargeable to each hour's operation of the oil-burning boiler. This figure was then subtracted from the hourly evaporation of the oil-burning boiler. From the fuel consumption and the cost of the fuel the cost of steam per thousand pounds was calculated to be 52.1 cents for oil, and 55.7 cents for coal. Although these figures are close, the advantage of cleanliness and flexibility which the oil-burning system possesses turns the balance clearly in favor of oil.

The low efficiency of the coal boiler will be noted. This is largely accounted for by imperfect combustion, indicated by the presence of *CO* in the flue gas. Since the load fluctuates between comparatively wide limits, it is necessary to change the draft frequently. Thus it is impossible to maintain for very long the best conditions of combustion. It is therefore not unreasonable to find an efficiency considerably lower than if the boiler

TABLE II. REPORT OF TEST ON BOILER USING COAL

Number and kind of boilers	one horizontal return-tubular
Water-heating surface, sq. ft.	1,268
Grate surface, sq. ft.	33
Distance from gate to nearest heating surface, ft.	2.59
Duration of test, hr.	9.83
Steam pressure by gage, lb. per sq. in.	78
Temperature of feed water entering boiler, deg. F	212.0
Temperature of escaping gases leaving boiler, deg. F	524.0
Force of draft between damper and boiler, in. water	0.21
Weight of coal as fired, per hour, lb.	529
Water evaporated per hour, lb.	3,910
Dry coal per hour, lb.	508
Percentage of ash and refuse based on dry coal	6.2
Equivalent evaporation per hour from and at 212 deg. lb.	4,050
Equivalent evaporation per hour per square foot of water heating surface, lb.	3.2
Water fed per pound of coal as fired, lb.	7.41
Equivalent evaporation per pound of dry coal, lb.	7.96
Calorific value of one pound dry coal, B.t.u.	14,722
Efficiency of boiler, furnace and grate (dry coal), per cent	52.6
Coal analysis, per cent:	
(a) Moisture	3.95
(b) Volatile matter	17.4
(c) Fixed carbon	73.4
(d) Ash	5.25
(e) Sulphur (separately determined)	0.51
Fluo-gas analysis (average), per cent by volume:	
(a) Carbon dioxide (CO_2)	11.4
(b) Oxygen (O_2)	6.8
(c) Carbon monoxide (CO)	0.44

Cost of Steam Generated by Coal

Water fed to boiler, lb. per hr.	3,910
Coal used per hour (as fired), lb. per hr.	529
Cost of coal, cents per lb.	.4125
Fuel cost of steam, cents per 1,000 lb.	55.7

were operated at constant load. In the case of the oil-fired boiler closer regulation can be effected, and fluctuations in the load can be met with less sacrifice of efficiency than is possible with coal.

These tests, the principal results of which are shown in the tables, were carried on by graduate students of the Sheffield Scientific School under the supervision of Professors Dudley and Lockwood, of the school.—*Power,* 13 June, 1922.

THE "MAJESTIC" AND THE "MAURETANIA."—During the month we described the new White Star liner *Majestic,* and gave some particulars of her machinery. Additional interest now attaches to this vessel on account of the fine performance she made on the homeward run of her maiden voyage, which ended on her arrival at Southampton on Saturday last. Her speed average over five hours on one day was 27 knots, and throughout the whole of a day she made an average speed of 23.59 knots. It is true that these results, good as they are, do not surpass the performance of the Cunarder the *Mauretania,* which, on her recent record run, made an average speed across of 26 knots and maintained 27.04 knots during one day; but they do show that the *Majestic* is capable of splendid steaming. We believe that in designing and in building the largest ship in the world it was the intention of her original builders and owners to make her unique not only in size but also in speed, with a view to regaining for Germany the Blue Riband of the Atlantic, which had been won by the Cunard liners *Lusitania* and *Mauretania.* For the *Majestic's* large displacement of 64,000 tons, her normal turbine rating of 66,000 shaft horse-power is on the conservative side, perhaps, and it would certainly appear from the maiden voyage and the voyage from Cuxhaven to Southampton that, without pressing, her machinery is capable of a larger output. As yet the *Majestic* is a new ship, but there is little doubt that when her engineers are fully conversant

with the capabilities of her boilers and turbine plant, the present excellent performance will certainly be improved upon.—*The Engineer*, 2 June, 1922.

VOYAGE AROUND THE WORLD OF MOTORSHIP "WILLIAM PENN."—On March 19 the *William Penn* completed her maiden voyage around the world of 28,500 miles. She is the first large American motorship suitable for deep-sea cargo trade. On her return to New York the propelling machinery was found to be in perfect condition, requiring no repairs. The exhaust and inlet valves of the main engines were changed only once, which was at the middle of the voyage. All work on the main engines was done by the engineer personnel when in port and all similar work on the auxiliary engines and machinery was done while under way at sea. There was no involuntary stopping of the vessel at any time throughout the voyage.

The two main engines are six-cylinder, 29⅛ in. by 45¼ in. They were originally designed to run at 115 r.p.m. and deliver together 4500 i.hp., but because of the full form of the *William Penn* the power was cut down by reducing the revolutions to 108, corresponding to an output of 4200 i.hp. and a speed of 11.5 knots. In addition there are three auxiliary Diesel engines each direct-coupled to a 65-kw. generator for supplying current to the various electrically driven engine-room and deck machinery. At sea only one of the auxiliary engines was required and carried a load of about 55 kw.

The mean speed from New York to London was 11.01 knots with a mean fuel consumption of 13.06 tons per day (exclusive of donkey boiler). The longest non-stop run was from Singapore to Suez, 4943 nauctical miles, taking nearly 18 days with a mean sea speed of 11.48 knots and mean total consumption of main and auxiliary engines of 13.41 tons per day, equivalent to a consumption per indicated horsepower of 0.3025 lb.

The original article gives a comparison between the *William Penn* and the electrically driven ship *Eclipse*, which, while not entirely strict, appears to be in favor of the motorship. It is also pointed out that there are several sister ships of the *William Penn* equipped with either steam turbines or reciprocating engines which have been laid up for the past year or more due to their inability to operate at a profit, while the *William Penn* sailed in April for the Far East again, carrying chiefly heavy or dead-weight cargo consisting mostly of structural steel and loaded down to the full-draft marks. With this class of cargo she is able to carry about 1000 tons more than an equivalent steamer, this amount representing the additional fuel and fresh water which the steamer has to carry.

On the way out the vessel encountered severe storms, and it became necessary to slow down to prevent losing the deck cargo. On the return trip the vessel was not fully loaded, although the cargo was of a bulky nature, consisting of hemp, copra, rattans, tapioca, coffee, etc. (*Marine Engineering and Shipping Age*, vol. 27, no. 5, May, 1922, pp. 313-314, 1 fig., *dc*)

AERONAUTICS

THE AIRSHIP AS NAVAL AUXILIARY.—In two interesting articles published last week *The Morning Post* discussed the airship problem with special relation to national defence, endeavoring to show that large dirigibles filled with non-inflammable gas may play a highly-important part in future naval warfare. The argument was developed with great ingenuity, and a vivid picture was drawn of the terrible damage that could be done to our shipping by a fleet of hostile airships working in conjunction with flotillas of ocean-going submarines. The writer asks us to visualize a convoy of troopships crossing the Atlantic in some future war. Owing to the tremendous range of visibility which an airship commands when at

high altitudes the convoy, it is argued, could not long escape detection, and once it had been sighted the airships would call up their submarines and proceed to make things lively for "the doomed vessels crawling along at 15 knots." They would first be attacked under cover of smoke-screens by torpedo-dropping planes, the ships so disabled being finished off by the lurking submarines.

Such a scheme looks plausible enough on paper, but we venture to doubt whether it would prove workable in practice. In the first place, airships are, and apparently always will be, too dependent on weather conditions to justify their being cast for any important rôle in a war operation which is to be carried out on a certain date which must necessarily be fixed sometime beforehand. Secondly, although an airship filled with non-inflammable gas might be more difficult to destroy than were the Zeppelins during the late war, it would still remain very vulnerable to the light shell guns which are already carried by the larger types of aeroplane. An important convoy of troopships would certainly be provided with aircraft-carriers, whose planes would give an uncommonly warm time to any airship that ventured to approach; while hostile submarines would be attended to by the convoy guard of destroyers and other fast vessels, armed with depth charges and all the other anti-submarine devices which proved so effective against the German U-boats. The argument that large airships, being capable of rising to heights unattainable by aeroplanes, will have little to fear from attack by the latter, is not convincing, for it was repeatedly proved during the Great War that the nominal maximum ceiling of an airship could only be achieved under ideal atmospheric conditions, and as a general rule aeroplanes were able to outclimb the largest Zeppelins. Evidence recently published in Germany goes far to confirm the impression that the German airships, at any rate, failed to make good as instruments of war, and few will deny that Germany was and still is far ahead of all other countries in the development of the lighter-than-air craft.

In the latest number of the *Marine Rundschau* there is a detailed account of the creation and war work of the German Navy's Zeppelin fleet, from which it appears that, apart from those used in training purposes, there were in all 72 airships under the control of the naval authorities, 22 of which were simultaneously available in 1915, 31 in 1916, 39 in 1917, and 23 in 1918. This aerial fleet was apparently used with great skill and vigour, yet it had no perceptible influence on the course of the war, and admittedly failed to justify the enormous expenditure of money, man-power, and material which its upkeep involved. The *Marine Rundschau* confesses that by 1918 the war value of the Zeppelin had sensibly declined. Not only had raids on England grown too hazardous to be attempted, but at the same time airship reconnaissance over the North Sea had become exceedingly dangerous by reason of the speedy and fast-climbing aeroplanes carried in British warships. The *L-70*, which was specially designed to cruise at an altitude of 23,000 feet, was shot down in flames by British warships on her maiden flight, the atmospheric conditions having been such that she could not maintain her maximum ceiling. In proportion to its numerical strength the casualties of the German airship fleet were colossal. Of the 72 vessels employed for active war work, 26 were destroyed by enemy action, 14 by bad weather, and 12 by accidental explosion. In the light of Germany's experience its seems to be established that the large rigid airship has a war value too limited to justify the perpetuation of the type, and while we agree that the development of airpower is a question of vital importance to this country, we should be sorry to see any part of the meagre funds now available for defence diverted to the creation of an auxiliary airship fleet.—*The Naval and Military Record,* 31 May, 1922.

INTERNATIONAL AIR FLEETS.—Although the Washington Conference did not lead to the imposition of restrictions on aerial armaments, it is known that this question was considered by a sub-committee which compiled a series of tables showing the authorized and actual strength of the great Powers in airships and flying machines on October 1, 1921. According to these tables Great Britain, on the date in question, had the following heavier-than-air craft in service:

Pursuit or combat 'planes	93
Attack, bombing, or torpedo 'planes	266
Observation, spotting, photographing, artillery, control, and infantry contact 'planes	236
Long-distance observation or scouting 'planes	99

Additional to these were machines used for training purposes, the inclusion of which gave the following totals in each of the above-mentioned categories: 117, 349, 48, 394, 140, or a grand total of 1,048. The number of French machines returned as available on the same date was 1,722, while the United States was credited with 537, Japan with 537, and Italy with 494 machines, the sum total of heavier-than-air craft at the disposal of the five great powers being thus 4,338.

French superiority was especially marked in combat 'planes, of which she had three times as many as Great Britain, and in observation planes, in which she outnumbered us by more than five to one. The comparatively small number of machines returned for the United States is rather surprising, though it must be remembered that, owing to the wide development of civil aviation in that country, the American air service could be largely reinforced in the event of war by commerical machines adapted for military work.

RELATIVE STRENGTH IN PERSONNEL.— As regards active personnel, the tables give the following totals of officers and men employed in the various air services:—

Great Britain	28,860
France	28,400
United States	12,443
Italy	6,330
Japan	520

The smallness of the Japanese total is probably due to the fact that the majority of officers and men engaged in air work are included in the personnel establishment of the army and navy. Assuming the foregoing statistics to be correct, it will be seen that Great Britain as recently as eight months ago maintained the largest air force in the world so far as personnel was concerned, though France had nearly 75 per cent. more machines.

Since then, there is reason to believe, the relative position of the two countries has undergone a considerable change, reductions on our side and increases on the French having given the latter a big lead in personnel, and a still more predominant position in respect of material. According to the Washington return, we had 545 machines of various types ready for home service last October, but it may be doubted whether anything like this number is effective to-day, as it was admitted in Parliament a few weeks ago that the force available for home defence was limited to 12 skeleton squadrons.—*The Naval and Military Record*, 31 May, 1922.

BOMBING OF DUMMY BATTLESHIPS.—The Air Service Detachment, consisting of two officers and 83 men, arrived at Mitchel Field on May 4, from Germany. This detachment was apparently assigned to Mitchel Field to be broken up and the personnel distributed to other Air Service stations.

This fact is regretted very much by Mitchel Field, because it is found that the detachment contains some very excellent soldiers and mechanics. The officers reporting with the detachment 1st Lieuts. Dogan Arthur and Russell M. Greenslade, A.S., have been ordered to report to Langley Field and Kelly Field, respectively.

In the course of dummy bombing demonstration given on Memorial Day Lieut. Victor E. Bertrandas hit the "battleship" Rock-and-Rye from an altitude of 3000 ft. three times. He was not unduly elated when he descended, however, for Rock-and-Rye was the name given to a warship model of wood and canvas, 25 ft. long, which served as a target.

At 2500 ft. Lieutenant Bertrandas missed the Rock-and-Rye by 100 ft. He mounted to the 3000-ft. level and dropped five more bombs, the first three of which landed fairly on the target, which burst into flames. A brisk wind was blowing at the time. Lieut. L. V. Beau was pilot.—*Aviation*, 19 June, 1922.

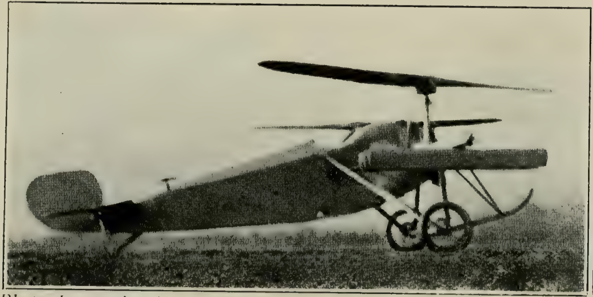
NAVY'S OWN AIRSHIP UNDER CONSTRUCTION.—"Made in America" ought to be stamped all over the envelop of the navy's own airship *ZR-1* when the giant rigid craft is completed at Lakehurst, N. J. For in design, structure, material and gas, this ship will be all American. Her characteristics necessarily will suggest the German dirigibles, but in every other way the *ZR-1* will be all our own. Work is now going on in earnest on the fabrication and erection of the airship. The fabrication has been one of the activities of the huge naval aircraft factory at Philadelphia for more than a year and now, after the most rigid and exhaustive tests of all elements of the framework, the duralumin members are being shipped to the hangar at Lakehurst, the largest building of its kind in the world. Here they are being assembled into the pioneer rigid airship to be built in this country.

Called the *ZR-1*, the ship has no connection of any kind with the unfortunate *ZR-2*, destroyed in England. The *ZR-1* is a smaller ship than the British-built craft which cost the navy so many valuable lives, and she is American designed as well as built. Her size and characteristics are based on measurements and data from the German rigid airship *L-49*, which was brought down intact in France during the World War. This was one of the Germans' most famous ships and her type was not replaced after her first trials, but was retained as the standard for further additions to the German airship fleet. Based on this type of rigid craft, and still further improved on the latest data of German rigid practice, tested at each step in construction, and inflated with the non-inflammable helium gas when completed, the *ZR-1* unquestionably will be the most dependable rigid airship ever constructed.

The *ZR-2* was of 2,750,000 cubic feet gas capacity. The dimensions of the *ZR-1* are 680 feet length, 78½ feet diameter, 93 feet height over all, and her capacity will be 2,100,000 cubic feet.

Behind all this activity has been American industry working with the navy in every way. The design and erection of the buildings called for hearty co-operation by construction and building specialty concerns, otherwise the hangar would not have been possible, and its vast size would have been a menace instead of a practical solution of the airship housing problem. For only with the solution of the almost instantaneous manipulation of the thousands of square feet of windows, which allow all gas to escape with the entering draft, and ventilating the shed throughout its entire space, could this shed be successfully used for the purpose.

The sash, operating devices and the colored glass to break the sun's rays in this great building were designed, built and erected by the Detroit Steel Products Company working with the navy. Similarly, other features



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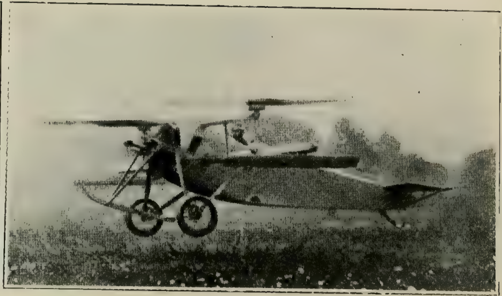
ON THE GROUND



"LIFTING OFF"

Henry Berliner's Latest Helicopter, on the Ground and "Lifting Off," Which Was Demonstrated Last Week at College Park, Md., to a Naval Technical Commission Headed by Commander J. C. Hunsaker.

of the hangar and mooring mast were designed and built by other American firms. This hearty team work has been responsible for the present status of the *ZR-1* more than any other factor in the enterprise.

This co-operative phase of the building of the *ZR-1* and the Lakehurst plant has been of the utmost value to aeronautical progress in this country. So great an interest has been aroused throughout the world, and especially in the United States, in rigid airships that the Aluminum Company of America has started work on a new plant at Pittsburgh for the rolling and shaping of duralumin for airships. Successful work has been done on drawing duralumin tubing, never before produced outside of Germany, and the various interests contemplating the building and operation of rigid airships in America, or throughout the world, may now purchase their materials in the United States. This is one of the great accomplishments that has come out of the navy's noteworthy enterprise in airship development, and it demonstrates that however deplorable was the loss of forty-four Americans in the *ZR-2* disaster, yet the airship as part of the fleet must be provided and that it is the duty of the navy to do its utmost to keep more than abreast with world advancement in these great carriers of the air.

The Navy department deserves great praise for building the *ZR-1*, which undoubtedly will contribute immeasurably to encourage the investment of private capital in rigid airship construction and thereby promote all those benefits to the nation which but await that magic touch.—*U. S. Air Service,* June, 1922.

THE BERLINER HELICOPTER.—The report, authenticated by photographs which dispel any doubt, that the latest Berliner helicopter has actually flown in a horizontal plane, will come as cheering news to those whose faith in the ultimate success of the direct lift machine has not been dimmed by the arduousness of the task.

As we said some time ago, several helicopters have lifted off the ground and have hovered, but an authentic instance of a controlled horizontal flight was yet lacking. Owing to the methodic efforts of Emile Berliner, the inventor, and of his son Henry, who tests the elder Berliner's machines in flight, we have come considerably nearer the solution of the helicopter problem. This problem is primarily one of stability, and secondarily one of propulsion. To solve the former Mr. Berliner devised a series of vertical vanes, controlled by the pilot, whereby, a given portion of the propeller disk area can be blanketed, which introduces a restoring couple. For horizontal propulsion a separate propeller, inclined to the path of flight, is mounted aft on the fuselage, and is apparently gear-driven from the engine. The entire arrangement is very neat for an experimental machine and further trials of the Berliner helicopter will be watched with interest.—*Aviation,* 26 June, 1922.

THE BRENNAN HELICOPTER.—Some months ago the British Ministry of Munitions announced that it would award a prize of £50,000 to the constructor of a helicopter capable of the following performance, carrying a pilot and one hour's fuel: first, rise to 2,000 ft. height; second, hover without any horizontal motion for half an hour in any wind up to 20 m.p.h.; and third, fly horizontally at a speed of 60 m.p.h.

These requirements are vastly in excess of anything that has hitherto been achieved with "direct lift" machines. As a matter of fact, with one known exception no helicopter has risen from the ground above fifteen or twenty feet, or hovered. The one exception known is that of the Austro-Hungarian *Captive* helicopter, built during the late war by Captain Petroczy, Prof. Karman and Herr Zurovec, which made a number of successful

ascents and on one occasion reached a height of 160 ft. An exhaustive investigation made of the subject by Prof. Karman shows that satisfactory stability is extremely difficult to achieve in a helicopter, and it was to simplify the problem that the Austro-Hungarian helicopter was made captive. The trials demonstrated, what was expected, that when the mooring cables were taut, the helicopter would be stable; but as soon as any slack appeared the machine would assume an oscillating motion.

In view of all the above it comes as a distinct surprise to read in the New York *Times,* in an exclusive dispatch from London, that Louis Brennan, inventor of the gyroscope, and of the torpedo which bears his name, "has gained fresh laurels by completing experiments with a helicopter which is understood to *meet fully the conditions laid down by the British Air Ministry* for a machine of this type."

Subsequent dispatches, however, seem to modify this news. It appears now that Mr. Brennan has not yet made free flight tests with his machine, but bases his hopes chiefly on experiments conducted with scale models. In fact, the Brennan helicopter has not as yet been tested outside of the hangar in which it is housed.

The prominence which the New York *Times* has given this report shows to what extent the idea of "vertical flight" appeals to public imagination, and at that mostly on the fanciful ground that it will enable aircraft to land on house tops. It would be desirable that soaring experiments obtain the same amount of publicity—but judging from the way in which Harth's great 21 min. flight was treated by the press this hope seems little founded.—*Aviation,* 12 June, 1922.

HELIUM AND THE ZR3.—The report that the U. S. naval airship *ZR3,* now under construction in the Zeppelin factory at Friedrichshafen as a "reparation" ship, is to be filled with helium for her transatlantic journey, is interesting news.

On one hand the mere fact that the navy intends to ship to Germany an amount of helium sufficient for inflating the big rigid airship, which is about 2,400,000 cu. ft. capacity, should be a convincing answer to those who still entertain doubts about the reality of helium production in this country. The opinion seems to be generally accredited abroad that American helium production is something in the nature of an interesting experiment rather than an accomplished industrial process. In particular, the actual amount of helium produced in this country for aerostatic purposes is a matter of speculation by many foreign lighter-than-air men. Thus, the opinion is often expressed that had we had sufficient helium for inflating the *Roma* we certainly would have done so—thereby preventing the loss of that fine ship and of its skilled crew.

Without going into the merit of this argument, the fact remains that at the time of the *Roma* disaster there was enough helium on hand to fill a ship the size of the *ZR3,* which gas had been extracted at a cost of about 13 cents per cubic foot. In comparison with hydrogen, which costs from one-half to one cent per cubic foot, the production of helium may seem a costly undertaking. As a partial insurance against fire hazard, it cannot be said, however, that this is paying too much for it, the more so as reasonable hope exists of reducing the production cost of helium to at least one-half, and possibly one quarter, of what it is today.

To achieve such a result further experimentation is needed. The helium maintenance fund of $400,000 asked for by the Chief of Naval Aeronautics at the recent hearings of the Senate Appropriations Committee, should, with a like sum provided by the Army Air Service, make this possible in addition to keeping the Fort Worth plant in operation at full capacity. At the present time this plant has a production of from 10,000 to 12,000

cu. ft. of 95 per cent purity per day, which seems inadequate in case the army and the navy should fill all their ships—including the *ZR1* and the *ZR3*—with helium. With the necessary appropriation, which was lacking last year, the Fort Worth plant should be able to produce almost 40,000 cu. ft. per day, an amount which should suffice for present requirements.

In view of the important role that will devolve upon airships in both the commercial and the military, or rather the naval; fields once the use of helium and heavy-oil engines will have eliminated the fire hazard, it is to be hoped that Congress will not reduce the amount asked for by the Chief of Naval Aeronautics for the maintenance and development of helium.—*Aviation*, 19 June, 1922.

SERVICE TESTS OF LAUNCHING CATAPULT.—Naval officers attached to the Bureau of Aeronautics are greatly pleased with the successful launching of the Service type seaplane, carrying a pilot and passenger, from an airplane catapult on the deck of the U. S. S. *Maryland* at Yorktown, Va., May 24.

The project of catapulting planes from a ship was first effected in 1915 on board the U. S. S. *North Carolina*, followed in 1916 by further experiments on the U. S. S. *Huntington*. The equipment used in those days was, however, too cumbersome and not sufficiently powerful to suit the needs of fighting ships and modern high speed planes. Consequently work was begun to produce a more compact and powerful mechanism which would perform that military function which even at that time it was evident would become an essential part of the duties of a man-of-war—the launching of protective and observation aircraft from its deck. The war, with its insistent demand for quantity production of patrol seaplanes for anti-submarine work curtailed experiments on this project, and it was not until last spring that the work, of which the successful performance of the 24 was the result, was started.

This device gives the United States a point of superiority over every other navy in the world in that none of them are in possession of an apparatus of this sort.

It is the intention to equip every vessel of the battle fleet with a catapult and fighting planes. The bombing operations carried on last summer by the joint forces of the navy and army showed the possible vulnerability of warships subjected to aircraft attack, and the lesson learned from these tests has taught us that the only answer to bombing and air attacks is the use of aviation itself, that is to say the carrying of fighting planes on all types of ships.

Almost eighteen years ago, Samuel Pierpont Langley, Secretary of the Smithsonian Institution, who had already demonstrated the practicability of mechanical flight, using an overhead launching device to start his steam and gas driven models, was nearly ready to undertake the launching of his man-carrying machine. On Oct. 7 and again on Dec. 8, 1903, he made two attempts to launch his large gas-engined, tandem "aerodrome" as he called it, but on both occasions he was unsuccessful, as the plane fell into the water almost before it was free of the launching ways. Later it was found that on each attempt some almost trivial accident happened, once a dragging part interfered with the release at the end of the track, while on the other occasion a guy post forward struck some object on the ways and the machine again plunged into the water, giving the observers a thrill and Charles M. Manly, the pilot, a ducking.—*Aviation*, 12 June, 1922.

ORDNANCE

TRAINING OF SPOTTERS.—With the aid of battery of 3-in. guns mounted on Rosa Island, the training of naval spotters at Pensacola, Fla., is now

carried on with increased efficiency according to a report from the Commandant of the Naval Air Station, Pensacola.

Spotting practice is considered one of the principle duties of a naval aviator in connection with the observation and control of fire from the fleet. His is an unique position, high above the scene of the capital ship in action, where he can view the splash of his ship's salvos, and judge the needed correction to bring the shells on the enemy fleet. Today student aviators are sent aloft at Pensacola in standard spotting planes, while the battery on shore fires at one or more targets out at sea. Observing the splash of the 3-in. guns, which reproduce actual conditions on a reduced scale, he advises the battery immediately by radiophone what correction to make and another salvo is fired. Spotting from the air is found to be far more accurate than from the fighting top of a battleship, and with the installation of plane launching devices on our fighting ships it will not be long before every ship of the navy has its quota of trained flying spotters who will co-operate with the gun crews of his ship.—*Aviation*, 19 June, 1922.

LIGHT CRUISER ARMAMENT.—We understand that the *Diomede*, our latest completed cruiser of the "D" class, differs from other ships of her class in having the 6-in. gun at bow and stern mounted in a closed turret instead of behind an open shield. This has been done apparently to obviate the effect of interference from the superposed guns, from which, in earlier ships, the blast is deflected by an overhang screen; but the closed turret may also have been adopted to improve the protection of gun and crew. In the light of war experience it is difficult to justify the retention of open shields for the main armament of cruisers. At Jutland several of these vessels on both sides were practically put out of action, so far as fighting power was concerned, by a few salvos of high-explosive shells, splinters from which laid low most of the guns' crews at their exposed positions. The *Southampton*, the *Dublin*, and the *Chester* were cases in point. No doubt the adoption of gun houses in place of shields would mean a considerable addition in weight, which is an all-important factor in light cruiser design, but this difficulty could be met to some extent by mounting the guns in pairs, instead of singly. It might be advisable even to reduce the number of guns, if by so doing the armament could be better protected, for there is little doubt that a crusier with eight guns all mounted in turrets would be a better fighting ship than one which carried twelve weapons behind shields.

In the latest foreign designs effect has been given to this principle, for the American *Omaha* class have all their guns completely protected by turret or casemate armour, and the new French light cruisers are reported to have their eight guns mounted in turrets. In our own service a certain prejudice exists against the twin turret for quick-firing guns, due to the unsatisfactory working of this system in the old *County* class; but it should not be impossible to design a twin turret which would give adequate protection against all but heavy direct hits, without interfering seriously with the rapid and easy working of the guns inside. In any case the effects of modern shell-fire on personnel in exposed positions are so terrible that it seems the wisest policy to make some sacrifice of handiness and rate of fire in order to ensure that the gun crews shall be able to fight their weapons without being struck down by the first shower of splinters.—*Naval and Military Record*, 14 June, 1922.

RADIO AND NAVIGATION

SUBMARINE CABLE TRANSMISSION.—A recent paper published by the *Journal* of the Franklin Institute deals with the experiments of Frederick

E. Pernot in an attempt to develop a method of signal transmission over submarine cables which would permit of a more effective use of existing cable systems. By this scheme signals are transmitted by means of alternating currents simultaneously with the normal battery, or direct-current, operation of the cable. Currents of several different frequencies may be used, reserving a given frequency for each message, and by tuning or equivalent methods at the receiving end these messages may be separated, so that the simultaneous transmission of a number of messages is rendered possible. Actual trial of the proposed alternating-current method was made covering distances up to approximately 700 kilometers with results which are said to be completely satisfactory.

U. S. RADIO COMPASS INSTRUCTIONS.—The most recent and probably the most valuable aids to navigation in a fog are the radio compass stations, developed by the U. S. navy and maintained by the U. S. naval communication service for the benefit of mariners generally and U. S. coastwise shipping, particularly.

The naval communication service will furnish radio bearings to mariners of all vessels equipped with radiotelegraph transmitters.

While the use of these bearings should not lead a mariner to neglect other precautions, such as the use of the lead, etc., during a fog, these bearings will greatly reduce the dangers to navigation for mariners who are compelled for any reason to proceed during foggy or misty weather.

These radio compass stations are provided primarily to assist the mariner in closing the land during fog or poor visibility, but they may also be used to obtain the positions of vessels at sea in radio compass range, about 150 miles, when for any reason positions can not be obtained by other means.

The maximum distance for which bearings from these stations are accurate is 150 miles. But accurate positions can not be plotted when more than 50 miles from the shore on Mercator charts, for the Mercator projection introduces a distortion of the true bearing. Charts based on the Gnomonic projection are essential to plot correctly long-distance radio bearings.

Such charts are now under construction by the Hydrographic office; until they are available mariners may use the Mercator chart for long-distance bearings, applying necessary corrections which may be obtained by various methods, one of which is fully explained on the backs of H. O. pilot charts of the North Atlantic Ocean for February, 1921; North Pacific Ocean for May, 1921; Indian Ocean for June, 1921; and Central American Waters for March, 1921.

Radio compass stations are divided into two classes:

(a) Single stations, operating independently and furnishing a single bearing. These stations are located with the view of giving service to ships at a distance of not over 150 miles from the station.

(b) Harbor entrance groups. All stations in harbor entrance groups are connected to and controlled by the master station; all stations of the group take bearings simultaneously and these bearings are transmitted to the ship requesting them by the control station. The purpose of these stations is to lead mariners to the light vessels off harbor entrances.

Where only one radio compass station is available, the mariner may fix his position by two or more bearings from the station with the distance run between, or may use the bearings as a line of position, or as a danger bearing. Or the bearing may be crossed with a line of position obtained from an observation of an astronomical body to establish a fix.

The following stations are within the continental limits of the United States:

ATLANTIC COAST

Bar Harbor, Me.
Cape Elizabeth (Portland), Me.
Gloucester, Mass.
Deer Island, Mass.
Fourth Cliff, Mass.
North Truro, Mass.
Chatham, Mass.
Surfside (Nantucket), Mass.
Prices Neck, R. I.
Amagansett, L. I.
Fire Island, L. I., N. Y.
Sandy Hook, N. J.
Mantoloking, N. J.
Cape May, N. J.
Cape Henlopen, Del.
Bethany Beach, Del.
Hog Island, Va.
Virginia Beach, Va.
Poyners Hill, N. C.
Cape Hatteras, N. C.
Cape Lookout, N. C.
North Island, S. C.
Folly Island, S. C.
Jupiter, Fla.
Key West, Fla.

GULF COAST

Pass a Loutre, La.
Burwood, La.
Grand Island, La.

ALASKAN COAST

Cape Hinchinbrook
Soapstone Point

PACIFIC COAST

Cattle Point, Wash.
Smith Island, Wash.
New Dungeness, Wash.
Port Angeles, Wash.
Tatoosh, Wash.
Ocean Park, Wash.
Fort Stevens, Oreg.
Empire, Oreg.
Eureka, Calif.
Point Reyes, Calif.
Bird Island, Calif.
Point Montara, Calif.
Farrallon Island, Calif.
Point Arguello, Calif.
Point Hueneme, Calif.
Point Fermin, Calif.
Point Loma, Calif.
Imperial Beach, Calif.

CANADIAN RADIO COMPASS STATIONS.—The following radio compass stations are maintained by the Canadian Government and keep watch and take bearings on the 800-meter wave length:

CANADIAN AND NEWFOUNDLAND COASTS

Radio Compass Station
Chebucto Head, N. S.
Canso, N. S.
Cape Race, N. F.
St. John, N. B.

—*Pilot Chart of North Atlantic Ocean*, July, 1922.

DIRECTIVE RADIO-TELEGRAPHY AND NAVIGATION.—In foggy weather sound-signalling stations have proved useful as an aid to navigation. The sounds heard, however, cannot be trusted to give accurate indications either of the distance or direction of the station. Their range is also very limited. It is not surprising therefore that many suggestions have been made, says *Nature*, for utilizing the electric waves used in wireless telegraphy to enable a navigator to find his bearings.

The propagation of electric waves is unaffected by fog and, unlike sound or light waves, can be transmitted to any distance. Moreover, the apparatus required for radio-signalling is very cheap, requires little skilled attention and can easily be installed in lighthouses. Until two or three years ago the radio-beacon—or the radio-phares as they are called abroad—were purely stations for giving ships their positions.

In order to find its bearings a ship must send a message to two or more stations and its direction is located by direction-finding coils. The stations then communicate with one another and so, by the help of triangulation, find the position of the ship, which is communicated by wireless. In practice the whole operation takes about five minutes. The most extensive chain of direction-finding stations is that controlled by the United States Navy. There are at least thirty stations on the Atlantic seaboard and several on the Pacific Coast. France has about ten radio phares and

Great Britain six. A drawback to this method is that valuable time may be lost in getting into communication with the radio-beacons and in getting the information back to the ship.—*The Nautical Gazette*, 17 June, 1922.

USE OF RADIOPHONE BY SMALL BOATS.—Personnel from the U. S. Naval Academy installed a small radiophone transmitting set on the referee's boat at the Poughkeepsie Regatta on June 26, and thus kept the Navy "rooters" at the finish line in constant touch with the start and progress of the race. Although this installation was in the nature of an experiment, it amply demonstrated the possibilities of the radiophone in following this particular branch of sport, and for communicating between small boats up to a distance of four or five miles. The antenna used was about thirty-five feet in length, while the battery, etc., weighed about 150 pounds.

EDITOR.

MISCELLANEOUS

THE "MAJESTIC," WORLD'S LARGEST LINER, MAKES ITS FIRST VISIT TO NEW YORK.—The White Star liner *Majestic* docked in New York for the first time in May. Not only is she the largest liner afloat, but she will very likely continue to have this distinctive position for some time to come. The *Majestic* is the result of the prewar competition for size and speed in transatlantic liners, and with the altered economic conditions and present high constructional costs, her equal will probably not be built for some time. Interest in the *Majestic* was doubless increased by the fact that her sister ship, the *Leviathan*, (formerly the *Vaterland*) had recently been sent to Newport News to be refitted for transatlantic traffic.

Originally built to the order of the Hamburg-Amerika Line at the Elbe shipyard of Blohm and Voss, Hamburg, and christened the *Bismarck*, work on her was well in hand when the outbreak of war came, and was continued till about the middle of 1916. After that time little progress was made, and about that period all copper pipes were removed and replaced by pipes of steel, which have for the most part been retained.

By the Versailles Treaty it was provided that vessels under construction should be completed by the Germans as designed and handed over to the Reparations Commission. The *Bismarck* was one of some twenty-five ships allotted to Great Britain, representing a gross tonnage of 225,000 tons. The White Star line purchased the *Bismarck* from the Reparation Commission, and renaming her the *Majestic*, began nearly a year ago to supervise her completion.

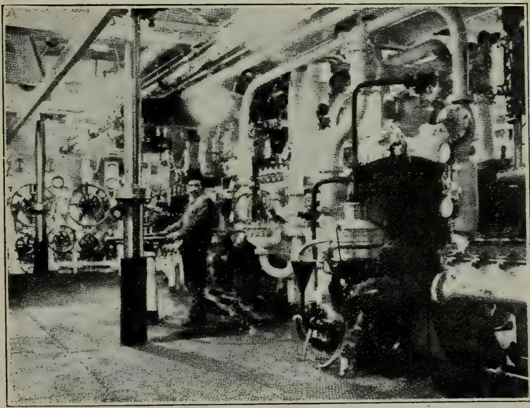
The *Majestic* has an overall length of 956 ft., and is 100 ft. broad, with a gross tonnage of over 56,000 tons, and a displacement of 64,000 tons when loaded to her marks. Her height from keel to boat deck is 102 ft., and the look-out man in the crow's nest is perched 180 ft., above the water line. A special feature in the design of the *Majestic* is the arrangement of her decks. Above the five steel decks, which run from end to end of the ship, there are four steel-plated erection decks which cover at least half her length. The boiler casings, instead of passing up the centre of the vessel, are divided and placed towards the sides of the ship, and are then carried up above the top deck, where they unite to form a center superstructure for the funnels. This method, which is adopted for two of the funnels—the third being a dummy funnel—permits of better ventilation for the boiler rooms, and from an architectural point of view admits of great breadth in the disposition and size of the cabins and public rooms throughout the seven decks on which most of the first-class passenger accommodation is provided.

The full complement of the *Majestic* is over 5000 persons, this number including 850 first-class passengers, 545 second-class passengers, and 2392 third-class passengers, with a crew of over 1100.

The *Majestic* is driven by four-bladed propellers, each with a one-piece boss, made by the Manganese Bronze Company, Ltd., of London. Fig. 2 shows one of the spares. The propelling machinery consists of quadruple turbines of the combined-impulse and reaction type, Curtis wheels being fitted before the Parsons drums. The turbines are arranged in two engine rooms on the port and starboard. The steam enters the high-pressure turbine on the port inner shaft, and passes on to the intermediate-pressure turbine on the starboard inner shaft, from where, equally divided, it again passes to the two low-pressure turbines on the outer shafts. Each separate shaft, however, is available for running or maneuvering by itself, but under ordinary working conditions the two low-pressure turbines operate in parallel. The total ahead horsepower is 66,000, and the astern power 36,000. According to contract, the vessel should travel at a speed of 23 knots when loaded to a mean draft corresponding to a departure draft of 35 ft. 6 in., and when the turbines are developing 66,000 shaft horsepower at a speed of 180 r.p.m., with a boiler pressure of 235 lb. per sq. in. On her run from Cuxhaven to Southampton she actually developed over 70,000 h.p. and a speed of 25 knots was reached. The astern turbines are subdivided into high-pressure and low-pressure turbines, and the low-pressure turbines are again placed on the outer shafts. By-pass valves are provided whereby high-pressure steam may be supplied to the other turbines, should at any time excess steam warrant this procedure. Thrust blocks of the ordinary pattern are provided. The turbines exhaust into pear-shaped condensers, and Weir's dual air pumps are installed. The turbine controls are all worked from a special control station (see cut) placed above the engine rooms, and all the main valves are hydraulically operated and electrically controlled. The boiler installation consists of 48 water-tube boilers of the Yarrow-Normand type, which are fitted with oil burners working on the White low-pressure system. The boilers, accommodated in four boiler rooms, are designed for a working pressure of 250 lb. per sq. in. The combined heating surface is over 219,000 sq. ft., and the total grate area exceeds 4000 sq. ft. The boilers are fitted throughout with Mumford's patent automatic feed controls. Aft of the main engine room is an outer engine room, containing 5 A.E.G. turbo-generating sets, each having an output of 280 kw. A large central switchboard is provided, from which the lighting and power requirements of the ship may be controlled. Current is supplied to over 15,000 electric lamps, in addition to various motors. On E. deck there is a special 70-kw. emergency dynamo, driven by an A.E.G. two-stroke cycle opposed-piston type engine of the Diesel type, with two vertical cylinders, which, along with its generator, is completely enclosed. The emergency set supplies current for the lighting and wireless installations, and also provides power for the six 20-hp. motors which operate the Welin boat-handling gear.

The system of telegraphs and telephones installed throughout the ship is very complete. Among the former may be mentioned the engine telegraphs, the starting telegraphs and rudder telltale. also the docking and anchor telegraphs, the boiler-room telegraphs and the distant revolution telegraph. A loud-speaking telephone system is installed for operating the ship and for communication between the engine and boiler rooms, and this system is so arranged that any boiler room can speak to any other boiler room or to the engine rooms and the engineers' department. Communication between the look-out man in the crow's nest and the bridge is established by a loud-speaking telephone in addition to the ordinary telephone. The ordinary telephone system for executive and departmental use has its own central exchange, which may be connected to shore when the vessel is berthed.

The White Star Liner "Majestic"



Turbine Control Station

There are three wireless stations, and the largest is capable of maintaining permanent connection with both continents during the whole of the voyage. A smaller station is used for communication over a distance of 800 miles, and a subsidiary one is reserved for use in case of an emergency. In addition to the usual signalling arrangements, special provision has been made to guarantee as far as possible the safe navigation of the vessel in fog. Submarine signalling gear has been installed, and the Willett Bruce electric fog bell and whistle fitted. The fire-alarm system includes some 450 fire alarms, distributed throughout the ship, which automatically indicate to the officer on watch when the temperature in any compartment has been exceeded. This system is centralized on the navigation bridge, and is combined with a smoke-detection device, consisting of lines of tubing through which air may be drawn. Other signals which are shown on the navigating bridge are the water-tight door indicators and the cooling-room door telltales. Electric clocks are fitted throughout the vessel. Every precaution has been taken to reduce as far as humanly possible dangers which might arise in case of fire or collision, and an ample complement of lifeboats is carried, including two motor lifeboats fitted with wireless. All boats are swung out and lowered on the Welin system, which, as previously mentioned, is electrically operated. A somewhat novel fitting is the Fram night lifebuoy, which may be instantly released from the bridge by electrical means. Fram anti-rolling tanks are also fitted in addition to the usual bilge keels. (Description of the *Majestic* taken from *The Engineer,* vol. 133, no. 3463, May 12, 1922, pp. 522-523.)—*Mechanical Engineer,* July, 1922.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"Bearing Metals"—*The Engineer,* June 2, 1922.

"When Steel Beams Stretch"—A new instrument for observing and photographing stresses in iron and steel—*Scientific American,* July, 1922.

"The Electric Propelling Machinery of the *San Benito*"—*Engineering,* June 16, 1922.

"Cunarder *Bercuzania* Converted to Oil-Fuel Burning" (illus.)—*The Marine Engineer,* June, 1922.

"Electric Welding," etc., by A. T. Wall—*Industrial Management,* June 1, 1922.

"The Influence in the Future of Aircraft upon Problems of Imperial Defence" (Gold Medal Prize Essay)—*The Journal of the Royal United Service Institution,* May, 1922.

"Accuracy of Airplane Bombing"—*The Journal of the Royal Artillery,* June, 1922.

"The Future of our Minor Armament"—*Journal of the United States Artillery,* June, 1922.

"The Archies and the Anti-Aircraft Service"—*Journal of the United States Artillery,* June, 1922.

NOTES ON INTERNATIONAL AFFAIRS

FROM JUNE 5 TO JULY 5

PREPARED BY

ALLEN WESTCOTT, Professor, U. S. Naval Academy

HAGUE CONFERENCE ON RUSSIA

CONFERENCE ORGANIZED.—The conference of European powers on Russian affairs met as planned at the Hague on June 15. Previous to the conference there was a sharp exchange of notes between Great Britain and France as to the policy to be pursued by the Allied Nations. France advocated agreement on a common program beforehand in order to present a united front and prevent a repetition of the Genoa failure. Great Britain, on the other hand, declared that to prepare a complete program for the rehabiliation of Russia and present it to the Russians as an ultimatum would be to make a travesty of the conference. Great Britain also upheld the right of any sovereign state to control the disposition of private property within its limits, to which France replied that the principle should have a different application in the case of a bankrupt state unable to pay for property seized.

Before the arrival of the Russian delegates, Foreign Minister Van Karnebeek of Holland, who presided, divided the conference into three sub-committees of eleven members each on Russian debts, foreign property, and credits. Great Britain, France, Italy, Belgium, Japan, and Holland had one member on each committee, the other members being distributed among the smaller states. It was decided by a majority vote, France alone opposing, that there should be no effort to agree upon a common policy before the arrival of the Russian delegates. France acquiesced on condition that she should be free to quit the conference at any time.

FRENCH AND BRITISH PREMIERS CONFER.—Premiers Poincaré and Lloyd George met in London on June 19. Action regarding German reparation payments was postponed pending investigation and report by the Reparations Commission as to what Germany could do to improve her finances without a foreign loan. It was agreed that at The Hague the experts should simply submit results to their respective Governments, who would be free to accept or reject. Plans were made for another conference in July over the Near Eastern situation and also with Spain over the Tangier question.

ARRIVAL OF RUSSIAN DELEGATES.—The Russian delegates to the Hague Conference, headed by M. Litvinoff, arrived on June 26. As the Russian delegation refused to divide into sub-commissions, after the fashion of the non-Russian delegates, the plan was adopted of having the Russians as one body meet the three sub-commissions in turn. While the Russian demands, as compared with those made at Genoa, were somewhat abated, they were still insistent upon a promise of credits from foreign powers and a long moratorium on Russian debts. The non-Russian delegates on the other hand called for definite statements as to the condition of Russian finances, the intentions of Russia in the matter of her foreign debts, and the purposes for which credits if granted were to be used.

RUSSIAN TRADE AGREEMENTS WORTHLESS.—Another declaration bearing on the Russian policy of the United States was made tonight by Secretary of Commerce Hoover in discussing trade with Russia. It came as confirmation of the conviction that there would be no change in the attitude of this Government toward the Hague conference or the question of having dealings with the present Bolshevist régime.

Mr. Hoover went at some length into the economic conditions in Russia, and said that the trade agreements which had been made with the Soviet by Great Britain, Germany, Italy and other countries were futile. Americans, he contended, had suffered no loss by holding back and refusing such agreements.

Russia, said Mr. Hoover, is without means of trading in commodities and is rapidly approaching economic paralysis. A day's ration of food in Russia in April, he said, cost 1,000,000 paper rubles, and the time was coming when the paper money would no longer buy and when, in the absence of precious metal, all business would have to be done by barter.

The American problem where Russia was concerned, said Mr. Hoover, was not that of trade, but that of investment.

"The feasibility of investing capital in Russia," Mr. Hoover added, "depends essentially on the policy of the Bolshevist Government and on the general internal situation, and not in any important degree upon action of foreign Governments."—*N. Y. Times*, 12/6.

GERMANY

BANKERS FAIL TO AGREE ON LOAN.—The committee of international bankers which met in Paris under the auspices of the Reparations Commission to consider plans for a loan to Germany adjourned on June 10 for three months. The adjournment without action was attributed to failure on the part of the Reparations Commission to give the bankers definitely a free hand in regard to recommendations for reduction of the German indemnity. In the Reparations Commission the proposal to extend this privilege to the bankers was favored by Great Britain, Italy, and Belgium, but opposed by France. In view of French opposition, the bankers decided that nothing could be done at this time.

Bluntly put, the Allies are betting on the United States finally coming to cancellation of the allied debts to the Washington Government. Certainly, the bankers' findings lend force to their argument. It is true the bankers did not go into a discussion of the interallied debts, largely because J. P. Morgan refused on the ground that he held no mandate from the

American Government. Yet any one who followed the talks of the eminent financiers knows they really gave deep consideration to the factor of the interallied debts. There is almost no argument which can be used for reduction of the German indemnity which does not apply to interallied indebtedness, with the possible exception of that of England.

The desire of France to avoid being drawn into a maneuver directed against the United States is one of the reasons invoked by the semi-official Temps today for the refusal of the French Government to approve of an international loan to Germany conditional upon a reduction of the German debt.

"France," says the Temps, "must not join in a combination which, by subordinating an international loan to a reduction of the German debt and a reduction of the German debt to cancellation of American claims, would appear like pressure upon the American Government by the European nations for the former to renounce what is due it.

"We believe the European nations should collaborate for the purpose of paying their debts and not of repudiating them. We hope our attitude will be understood at Washington, and if some of the representatives of the United States favor and counsel other Governments of Europe to adopt another policy they are not in accord with the Department of State."—*New York Times,* 10 June, 1922.

BERLIN FINANCES EXAMINED.—On June 16 the Committee on Guarantees appointed by the Reparations Commission left for Berlin to begin the work of arranging for supervision of the receipts and expenditures of the German Government and for a statistical statement of German finances. At the same time the Reparations Commission sent a new note to Germany, emphasizing in particular the matter of a forced internal loan, the covering of the budget deficit, and the autonomy of the Reichsbank.

FOREIGN MINISTER RATHENAU MURDERED.—Foreign Minister Rathenau, leading figure in the Wirth Cabinet and representative of Germany at Genoa, was assassinated in Berlin on June 24. The murderers fired from another car into the Foreign Minister's automobile and hurled a hand grenade which exploded with terrific force. Evidence indicated that the murder plot was carefully worked out by nationalist secret organizations by whom Rathenau was doubly hated as a Jew and as a leading advocate of the fulfillment of Germany's treaty obligations.

IRELAND

RESULTS OF PARLIAMENTARY ELECTION.—Elections for the new Irish Parliament which is to act upon the Anglo-Irish Treaty and the new Irish Constitution were held without serious disturbances on June 16. The result was a decided strengthening of the Pro-Treaty Coalition, as indicated by the following figures given out on June 21.

Pro-Treaty Coalition	55	Trinity College	4
Anti-Treaty Coalition	33	Farmers	6
Labor	15	Undecided	9
Independents	6	Total	128

The labor and independent vote is counted in support of the treaty.

NEW IRISH CONSTITUTION.—Negotiations in London between Irish and British cabinet members resulted satisfactorily in June, and a draft of the new Constitution was published on June 15.

The proposed Consitution of the Irish Free State declares itself to be "the Constitution of a free democratic state." It puts into form and substance the agreement known as the London Treaty. Constitution and Treaty alike set up in Southern Ireland a Dominion known as the Irish Free State which in all its broad principles and in many details conforms to the Dominion of Canada and is part of "the British Commonwealth of Nations"—a phrase used purposely in the Constitution instead of "the British Empire." It is a very modern form of government, for it contains provisions for woman suffrage, proportional representation, a referendum, and the power of initiative. It exempts the Free State from participation in foreign war except with the consent of its own Parliament or in case of actual invasion; it provides for freedom of religion and conscience and contains what is equivalent to a bill of rights. The Free State may maintain its own army, and it is pointed out that this goes further than is the case with Canada, which acknowledges the supreme command of military forces to rest with the Crown. The Free State will have an Executive Council, appointed by its Governor-General, but the council will be responsible to the Irish Chamber of Deputies, which corresponds to our House of Representatives, and the President of the council, who will really be a premier, will be chosen by the deputies.

The points in the Constitution which have provoked most dissension from extremists are two. One relates to the oath of allegiance to be taken by the representatives; the other relates to the fact that appeal lies in certain matters from the Irish Government to the Crown; just the same thing exists in Canada, but the opponents of the provision point out that it is a dead letter in Canada, while they do not feel sure that it will be in Ireland. These and other objections are not fiercely urged, and, in general, the proposed Constitution seems to have met with almost surprising approval in Ireland itself.—*Outlook*, 28 June, 1922.

FREE STATE ATTACKS REBELS.—On June 26, Mr. Winston Churchill stated in the House of Commons that the British Government intended to call upon the Provisional Government of Ireland to suppress the rebellious faction of the Irish Republican army and carry out the popular will as expressed in the recent election. He also stated that British troops were to be used along the Ulster border to prevent violent measures against the Ulster government and that 50,000 stands of arms had already been sent over.

On June 28, the Free State Government began active measures against the Republican irregulars in Dublin and particularly against the forces in possession of the Law Courts under Rory O'Connor. Two days later the buildings were burned and battered down and the garrison forced to surrender.

INTERNATIONAL AGREEMENTS

NAVAL TREATY RATIFIED.—It was announced on June 12, that all the Washington treaties, with the exception of the Naval Treaty, would be ratified by the British Government simply by acts of the Privy Council without submission to either house. The Naval Treaty would be submitted indirectly in the form of an enabling bill to carry its provisions into effect.

The Japanese Privy Council ratified the Yap Treaty on June 21, and the Naval Treaty a week later.

OPPOSITION TO PALESTINE MANDATE.—On June 21 the British House of Lords condemned the terms of the British Palestine mandate by a vote of 60 to 29. The opposition claimed that the mandate made Great Britain responsible for a Zionist political predominance in Palestine where 90 per cent of the population was non-Zionist, and that it would give rise to bitter hostility on the part of the Arabs.

In reply the Earl of Balfour, in his first speech in the House of Lords, declared it was impossible otherwise to establish a Jewish home in Palestine and that ample safeguards were provided for the Arab population.

FAR EAST

NEW JAPANESE CABINET.—On June 11, Admiral Baron Kato accepted the Premiership of Japan, his one condition being a reduction of the army budget to 40 million yen and adoption of a general policy of military retrenchment. The new cabinet is expected to have the support of the Seiyukai majority party in the Diet and a majority also in the upper house.

Kato's policy is stated in general to be favorable toward ratification of the Washington Treaties and toward a foreign policy of peace and friendly relations between Japan and China.

Tokio, June 12 (Associated Press).—The Cabinet of ex-Premier Takahashi, smashed through opposition to his liberal ideas, has been succeeded by one whose announced watchword is economy and which, a portion of the vernacular press declares, has tinges of reactionarism.

These comments, directed so far chiefly at the new Premier, Admiral Baron Tomosaburo Kato, who took office today, are reinforced by others leveled at his policy of naming a non-party Government. Most of the Ministers have seen service in former Cabinets or in other governmental positions. Two, besides Kato himself, are retained from the Takahashi Ministry—Viscount Uchida, who holds the Foreign Affairs portfolio, and Enkichi Oki, Minister of Railways.

EVACUATION OF SIBERIA.—On June 28, the Japanese Diplomatic Advisory Council set October 30 as a definite date for withdrawal of Japanese troops from the maritime province of Siberia. Whether this decision will be accepted by the military authorities in Japan remains to be seen. The decision in any case would not affect the northern part of the Island of Sakhalin, which Japanese forces hold pending satisfaction for the Nikolaievsky massacre.

CONTINUED FIGHTING IN CHINA.—In spite of the report of an armistice between General Wu Pei-fu's victorious forces and those of the Manchurian leader Chang Tso-lin, the latter attempted a surprise attack on June 11, and during the week following was driven northward toward Mukden after heavy fighting.

Li-Yuan-hung, former President of the Republic, agreed to accept the office once more in an effort to establish a unified government. Dr. Wu

Ting-fang, former Minister to Washington and prominent South China leader, was offered the premiership on June 11 but refused to accept. It was reported that Dr. Wellington Koo, ex-Minister to the United States, was slated for the Ministry of Foreign Affairs.

In the South, President Sun Yat-sen of the Canton Government refused to resign and thus clear the way for the reunion of China under one rule. On June 18, however, the Canton President was forced by one of his mutinous generals to leave the city and take refuge on one of the five Chinese gunboats in the harbor.

NEAR EAST

TURKISH FRONT STABILIZED

The Allied military observers held a conference at Constantinople during last week, dealing with the military situation on the Asia Minor front. It is said the consensus of opinion was that no serious military campaign was likely to be launched this Summer by either the Greeks or the Turks.

The Greeks have great numerical superiority on the front line, but the opinion is that the superiority is not sufficient to justify an offensive in view of the difficulties of the terrain. The present Greek force includes 110,000 rifles, while the Turks number 70,000. The Turks also are inferior as regards equipment, although they have received considerable supplies during the last six months from two important sources which the allied observers decline to name.—*New York Times,* 19 June, 1922.

LATIN AMERICA

CHILI-PERU ARBITRATION.—During June the conference in Washington between Chili and Peru over the Tacna-Arica question was in deadlock, Peru offering to arbitrate the general question whether or not a plebiscite should be held in the disputed territory, and Chili consenting to arbitrate only the conditions to govern the plebiscite. It was anticipated that Secretary of State Hughes would attempt to end the deadlock by seeking a common ground upon which the two parties would agree to arbitration by a neutral power.

MEXICAN DEBT AGREEMENT.—On June 16, Minister of Finance de la Huerta of Mexico signed in New York an agreement with Thomas W. Lamont, Chairman of the International Committee of Bankers on Mexico, providing for resumption of interest payments on the Mexican debt on January 1 next, with further provision for completion of payments of back interest by January 1, 1928. In return, the bankers' committee agreed to "recommend that the bond holders make substantial adjustments of their rights,"—in effect cancellation of most of the back interest. The total debt is estimated at about $500,000,000, with $200,000,000 arrears in interest.

Huerta later held conferences with representatives of oil companies operating in Mexico over the question of a government taxation and policy toward development of oil areas.

REVIEW OF BOOKS

"BRITISH FLAGS," by W. G. Perrin (Cambridge University Press 1922, Thirty shillings-net).

This volume, an example of the taste and skill in bookmaking for which the Cambridge University Press is distinguished, is a history of British flags by the librarian of the British Admiralty. It contains thirteen plates of flags, coins, and seals; a colored frontispiece representing a ship of Henry VIII, and 204 pages of text. The first chapter is devoted to a survey of the origin of flags, and while this is a rather uncertain field because of the difficulty of tracing an evolutionary process, it shows not only industry but knowledge, and most of its conclusions appear to be sound. Certainly most people will agree with the author that national flags probably originated in the Italian city-states, because the obvious debt of modern civilization to these intermediaries between it and Rome makes this likely, even if there were no more definite evidence to support it. Following chapters deal with: early English, Scottish, and Irish flags; flags of command; colors of distinction; flag signals; and ceremonial and other uses of flags. For the most part these refer to ships' flags, and the discussion is rather full, sometimes, it would seem, almost too full; for the plan involves considerable repetition, and while the style is easy, there is at times a lack of smooth connection that suggests the bald directness of official documents. On the whole, however, the book is very readable. The chapter on signals is a very good treatment of the subject, and there are a number of interesting things scattered through the book. One is the evidence of the influence exerted by Samuel Pepys on the development of the British navy; for his papers are constantly cited to show the origin and systematizing of the use of flags, as they can be to show the beginnings of much else that is now common naval practice. Another thing is the influence exerted by the military profession in evolving the modern professional navy. It is not generally recognized how much sea fighting owes to land warfare for its precision and discipline, and this book, in many ways, shows the close connection between the two main fields of military activity. The book, in fact, contains much collateral information, and is a useful addition to naval literature.

Sidney A. Gunn.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of life, regular, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become asociate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Asociate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

Naval Institute Prize, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the Proceedings during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the Proceedings during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles submitted be typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

C. C. GILL,

Lieut. Commander, U. S. Navy, Secretary and Treasurer.

TOPICS FOR ARTICLES

Suggested by Request of the Board of Control

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
Shore Duty for Enlisted Men.
The Limits of Specialization in Naval Training.
The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.
Armor or High Speed for Large Surface Vessels?
Airplanes and Submarines Versus Super-Dreadnoughts.
The Navy's Relation to the Nation in World Affairs.

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VE-7 Seaplane Leaving Turntable Catapault on U. S. S. "Maryland"

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVAL MORALE AFTER WAR

Address Delivered By
Rear Admiral Wm. S. Sims, U. S. Navy,
President, Naval War College,
to the
Graduating Class of 1922

After every considerable war, certainly after every war that has enlisted the passionate energy of all the people, there must inevitably be a period of mental and moral reaction, not only a letting down of the military zeal and enthusiasm fostered by war and national danger, but, most characteristic of all, such a lessening of the people's interest in their national defenses as seems almost to amount to total forgetfulness—not so much of the services rendered by the army and navy during the war, as forgetfulness of the unnecessary sacrifices of valuable lives that have always resulted from our previous lack of preparedness, not to mention the less important, though colossal, financial sacrifices that reasonable preparedness would have prevented.

This is a condition that has confronted us after each of our wars, notably after the Civil War, and we are now called upon to face a similar condition.

We believe that in this matter of public indifference to preparedness we are more unfortunate than any other country. This is doubtless the natural result of our geographical position and

the conditions of our national life. Until recently we have not had to concern ourselves very much with international affairs. We have always been successful in our wars, badly conducted though they have been. We have never had an enemy march in triumph through our capital and force us to pay a heavy indemnity. Our people have never really believed in the possibility of another war, except as a remote contingency.

The inevitable consequence has been, and now is, that once the object of the war is attained, the public loses interest, forgets the sacrifices caused by unpreparedness, and consents to, or does not oppose, such reductions as to keep our forces in a condition of continuous unpreparedness.

We military men keenly realize the depressing effect upon morale of such drastic reduction in our personnel and equipment as will preclude the carrying out of the training which our studies and experience have shown to be necessary to the maximum efficiency. We are all aware that unless discipline and national spirit are of superior quality, unless military men are animated by something higher than the mere habit of mechanical obedience, we shall never be prepared for war, no matter what the number of our ships or the perfection of our matériel.

In what spirit are we, the commissioned officers of the navy, going to meet this situation? We naturally deplore the apathy of the people and what appears to be the unwisdom of the Congress in again exposing us and the country to the possible risk of sacrifices as inevitable and as grievous as those that unpreparedness brought upon us in the Great War. We are naturally inclined to blame the people and our representatives, and let it go at that, disclaiming all responsibility for any resulting inefficiency. But once the final decision is made, it is one of our most important duties to resist this impulse, to accept loyally the conditions imposed upon us by the civil authorities, and to make a careful estimate of the situation with a view to maintaining such units and personnel as are left us in as efficient a condition of instruction, training and equipment as possible; and, more important than all else, of maintaining to the maximum degree the morale of the personnel—the mental state which includes confidence in and loyalty to the navy, and the will to victory.

We should deserve small credit for maintaining efficiency in

a navy provided with everything we could wish for. We have never enjoyed this perfection and we never shall. It is now, and doubtless always will be, our mission to get the maximum efficiency out of inadequate matériel and personnel. This is the normal duty of the American naval officer; and this duty cannot be fulfilled if we begin by being sorry for ourselves.

The present state of the navy is not unique. We are but the heirs of American systematic unpreparedness, the successors of those who have survived much worse conditions—not, to be sure, without a temporary lowering of morale, but who nevertheless "came back" and maintained the discipline and traditions of the service until the next emergency forced the public to consider its naval needs.

Chief Engineer King of our navy, in his book, *War Ships and Navies of the World,* published in 1881, says that "American naval history presents but two or three periods of exceptional activity and importance in war; the long intervals between these epochs have been chiefly marked by gradual decay and general inaction. The several great national emergencies have each called forth most remarkable displays of maritime capabilities and prowess, to be followed, when the crisis was past, by a revulsion to the other extreme of inefficiency and neglect."

Perhaps a brief account of former conditions would best help the naval officers of today to realize how truly fortunate is their condition compared with that which their naval forbears successfully withstood for many years after the Civil War. Even as late as 1880, when I was graduated from the Naval Academy, and for many years afterwards, our navy was in a deplorable state, both as regards matériel and personnel. Generally speaking, it was still a navy of wooden ships and smooth-bore guns, while the navies of Great Britain, France, and many other countries contained many heavily-armored and powerfully-gunned turret vessels.

In April, 1861, we had 34 steam vessels and 39 sailing vessels. By the end of the Civil War, in 1865, we had nearly 700 vessels. Three years later we had 43 vessels, and ten years later still, in 1878, we had but 17, and none of these were of the first-rate.

Chief Engineer King says: "The American Navy is not at present (1880) possessed of a single armored seagoing vessel, and

has strictly but few modern cruising vessels and no armaments of modern rifled guns; in these respects it differs at present from the navies of all considerable European powers."

To the great majority of our officers the ships of 1880 are now but names. The wooden first-raters, *Franklin, Minnesota, Colorado, Wabash,* and *Tennessee,* were of about 5,000 tons, speed 9 knots, and armed with 8-inch, 9-inch, and 11-inch smooth-bores; 12 vessels of second-rate, from 2,000 to 3,000 tons, 9 to 12 knots, were similarly armed. The only armored vessels were 14 monitors displacing about 2,000 tons, with a speed of 6 knots and armed with smooth-bore cannons, and several larger monitors upon which building was suspended.

At this time France had 57 armored ships, from 3,000 to 11,000 tons, speed 12 to 14 knots. Of these ten were first-class ships whose characteristics were quite similar to the battleships of to-day. They were armed with breech-loading rifles of from 9½ to 13½ inches in calibre, mounted in turrets, half turrets or in barbettes. Italy had 17 equally powerful ships, from 3,000 to 13,000 tons, speed 10 to 16 knots, and 4 of these were armed each with four 100-ton Armstrong guns.

Great Britain had over 50 armored vessels more powerful in the aggregate than those of any two or three nations.

Even the Russian, Austrian, Dutch, and Turkish navies had modern armored ships, armed with rifled cannon.

My first duty at sea was on the old wooden, full-rigged, steam frigate *Tennessee,* flagship of the Atlantic Fleet. Six midshipmen of my class reported on her for duty in the summer of 1880, forty-two years ago, and joined a steerage mess of twenty-two members, quartered in two compartments, each 7 feet wide and 11 feet long. Each of us had a locker for our clothes on the berth deck, and all hands slept in hammocks. The principal military drills were with the smooth-bore guns and in repelling boarders with sword and pike, and were purely perfunctory. The fleet comprised the *Vandalia, Swatara,* and *Ossipee* of about 2,000 tons, and the *Yantic* of 900 tons. The fleet speed was 8 knots. You can imagine what fleet maneuvers were like. The only competition between ships was in sail drill and smartness in sending up topgallantmasts and yards at 8 A. M., and sending them down at sunset. Target practice was then, and for many years after-

wards, considered a nuisance and was a pure farce. The object was to get it over as soon as possible and clean up the mess it made.

These are not exaggerated statements. Upon one occasion, as late as 1901, I witnessed the target practice of a monitor. The greasy smoke of the first shot from one of her turrets covered the object glass of the telescope so completely as totally to obscure the pointer's vision and consequently to arrest the fire, and, incidentally, to enrage the captain, who, upon being informed of the cause of the delay, ordered the firing to be continued just the same; and the remainder of the ammunition allowance was accordingly fired by the turret officer aiming the gun by sighting over a ring bolt on the forward rim of the turret. Of course, no hits were made, but the captain's declared object of returning to port on schedule time was accomplished.

The contrast between vessels of our navy and those of foreign navies was most disheartening. I remember very distinctly the impression made upon our midshipmen when they were allowed, during a practice cruise, to visit the old British broadside ship *Bellerophon*. Though she was then a back number in her own navy, having been launched in 1865 and long since outclassed by many turret and barbette ships, we thought her very wonderful with her 7,500 tons displacement, ten 12-ton guns, 6-inch armor, and 14 knots speed. We realized that she alone could probably defeat our entire Atlantic Fleet.

Under such conditions, all drills and exercises were regarded as necessary drudgery, and there was of course no systematic instruction in the art of war. The few officers who made a study of strategy and tactics and who attempted to convince the service of the necessity of instruction and training in such subjects were decried as impractical theorists and highbrows. The suggestion that a war college be established for so-called practical naval officers was a subject of ridicule, and was vigorously and successfully opposed for many years.

Naturally, the currently expressed sentiment was: "What's the use?" I am sure that only officers who have experienced such conditions can realize their effect upon morale. At that time there was very little of it as we now understand the degree that is necessary to efficiency. It is no wonder that many took to

drink, that many regarded their positions in the navy as a job instead of a trust.

But still the spirit was kept alive by the few who realized that it is men and not ships that count, and who devoted themselves, as well as our resources would permit, to the training and instruction of the personnel. Foremost among these was the forceful man who let nothing discourage him in his efforts to establish this college, Rear Admiral Luce, and who subsequently protected it and successfully maintained it against the assaults of its enemies both inside and outside of the navy.

When we contrast the doleful condition of our navy in 1880 with its present condition, discouraging as that is, we certainly have no reason for self-commiseration.

The military characteristics of our war vessels are now determined only after thorough discussion, by experienced line officers, of the practices of the fleet and the tactical and strategic studies of the Naval War College; and the result is vessels of the various types that in most cases are the equal of any in the world.

Our personnel has just shown in the recent war that its morale was proof against the needless sacrifices caused by ignorance, indecision and mismanagement in Washington.

The navy now has a War College based upon the intellectual freedom of successive groups of student officers to determine the influence of current fleet experience and of new weapons upon the principles and methods of modern warfare.

Officers now understand that serious study is necessary to acquire the knowledge of and training in the art of war that are essential to efficiency; and that no officer can hereafter exercise high command, with the confidence and respect of the service, unless he has attended the course at the college that is maintained for the sole purpose of insuring efficient direction of our navy as a whole.

In so far as concerns the future efficiency of our navy, the mental attitude of our commissioned officers is more important than any other element. The difference between this attitude today and that of forty years ago is really fundamental as regards the necessity of continuous study and training. Formerly, our naval officers honestly believed that their practical seagoing experience was

all that was required to fit them for the efficient conduct of war on any scale. This belief was so firmly rooted that it fostered a feeling of conceit so nearly universal that to attack it was deemed disloyal. Happily there remain but a few of the old guard who still enjoy this very comfortable conviction; thoughtful study and experience have abolished our conceit as a naval characteristic, so that even those who have enjoyed all of our present educational advantages, both of study and experience, fully realize that open-minded and continuous study of the rapidly changing conditions of modern warfare is essential to the maximum efficiency of the individual, and as the maximum success in preparation for war will depend not only upon the direction of the navy as a whole by officers of the highest attainments, but also upon a high average of these qualities in all officers and in all grades, it is clear that it is the duty of each officer to make himself, and those whom it is his privilege to command, as efficient as possible in training and military character. It has been well said that "the soul of the army is the mind of the individual." The same applies, of course, to the navy.

This education of the entire personnel I conceive to be the primary mission to be carried out loyally and cheerfully in the conviction that by so doing we shall not only render our existing forces efficient, but command the respect and confidence of the public until such time as the people themselves have come to realize that what we naval officers call our navy is really their navy, of which we are a part—to realize the importance of keeping it prepared for war, and to understand the uselessness of a navy that is not continuously so prepared.

We may be sure that in time the increasing interest of the people in international affairs will bring them to a clearer understanding of our national needs in this respect. Henderson says:

> The importance, nay the necessity, that the people, as a governing body, should keep as watchful an eye on its armed forces and the national defenses as on diplomacy or legislation is fully realized, naturally enough, only by those nations whose instincts of self-preservation, by reason of the configuration of their frontiers or their political situation, are strongly developed. Yet even to maritime empires, to Great Britain or indeed to the United States, an efficient army is of the first necessity. . .

and this applies all the more strongly to the navy—our first line of defense in war and in diplomacy.

Unfortunately, as yet the people know all too little about naval affairs and national defense, though they have taken more interest in these subjects in recent years than ever before, as has been plainly indicated by their effective opposition to the proposed drastic reduction in naval personnel; and naval officers should take advantage of this interest by responding to the numerous invitations to address clubs, forums, and societies on naval subjects.

In the above remarks I have attempted to make clear that our present situation is vastly more advantageous than at any former time after a war; and I have outlined what I understand to be our duty as naval officers in the premises. As, however, I am of course conscious of the degree of honor likely to be accorded a prophet in his own navy, I believe it will be to our advantage to consider this matter from the point of view of an experienced Congressman who is very sympathetically in favor of adequate military preparedness.

Representative Frank L. Greene, of Vermont, a member of the House Military Committee, has published his impressions of the situation that will confront the army, and his advice to its officers, if the commissioned and enlisted personnel is reduced below the number considered necessary by the War Department. I believe there is no doubt that Mr. Greene's concern for adequate national defense is such that his interest in preparedness is as keen for the navy as for the army. At all events, the advice he gives the officers of the army, based upon his extended experience as a legislator and upon his knowledge of the influences governing the Congress, is equally valuable and equally encouraging to the officers of the navy.

His analysis of the duty of army officers in the present situation appears to me so reasonable, so appreciative of the military officer's concern for adequate preparedness, and so sympathetically considerate of the effect upon them of the people's apparent forgetfulness, now that the danger is passed and the war services of the army and navy are no longer actually required, that I make no apology for quoting at length Mr. Greene's cheering advice, which is as follows:

As a matter of practice I do not like to anticipate congressional action by any attempts at prophecy in public or by any anticipatory criticism

of anything of the kind. However, I am not at all averse to expressing my judgment as to what it might well become the army to do under the circumstances, and inasmuch as I do not need to assure you of my warm friendly concern in the army's welfare, I do not hesitate to venture a few suggestions.

In the first place, when all is said and done, this country may count itself lucky that it has not shared more deeply in the general popular reaction that has all over the world followed the Great War. We are lucky indeed that the "let-down" of tense nerves and strained minds and wearied flesh has not precipitated us into troubles even more serious than those we now experience.

Whatever may be the psychological aspects of the business, whatever may be the true situation with regard to this, that or the other phase of it, we are quite certain of one prominent fact and there is no possible escape from it—and that is that the government as well as the people must economize for several years to come, and economize in something more than a perfunctory fashion, too. No matter how we turn or with what argument, to face this or that condition or to question the responsibility for this or that condition, this one sober fact stares us in the face at every move—we must economize.

Now, of course it is always true that economy should be observed with good sense and discretion and that there is such a thing as overdoing it and ruining the very agency that one might otherwise hope to save. It is true that misdirected economy is often destructive or at least weakening of agencies and institutions that should be preserved in life and activity.

I can understand with very sympathetic interest how the War Department and the army literally shiver at the prospect of having to undergo such radical and drastic treatment at the hands of congressional economists that the very heart and hope are cut out of the plans for the national defense and of the training of soldiers and citizens for the national defense that are the result of years of study and the hard-bought lessons of experience on the battlefield. I know it is discouraging.

Of course there is a jar to the high-tensioned, high-purposed professional mind in all this. There is a dread of ruthless assault upon ideals, practical ideals, and much of that kind that is something more than merely discouraging to professional ambition.

There is also, and this is more important, the deep sense of injury to a very vital governmental policy, a policy that has been learned through nearly a century and a half of cruel and bitter experience in wars. The army naturally feels that it is a custodian of that experience and should be held in confidence and trust as a great instrument that is to conserve that experience, profit by its teachings, and be responsible to the people at any time for the state of preparation for defense of the nation in any crisis.

But I would say to the army at this time that it can only be held responsible for that degree of preparation for national defense that the congressional policy and appropriations will permit.

After we have each in our several spheres made the best argument we can why economy should not go beyond a certain point, we must all prepare ourselves in whatever agency of the government we may be situated, for a period of enforced and rather drastic economy, after all. There is no use trying to reason out of it or to give any excuse why one should not be included in it. It is a condition and not a theory, in all the significance of that much used phrase. Economy is going to be applied to every agency and institution of this government. Perhaps in many respects Congress may be persuaded to make all those economies reasonable. But in any event, those agencies and institutions that accept that policy with a smile and make the best of the circumstances are most likely to emerge at the end of that period with something like that degree of popular and congressional confidence that may make their path smoother thereafter.

That is about all I have in mind to say just now. I think the army will be very, very wise if it takes its medicine with a grin, buckles down to work, makes the best it can of a hard situation, summons all the philosophy of Mark Tapley to its aid, breathes cheerfulness and hope and loyalty and good faith constantly in all its relations with the government and the people, tightens up its belt, and works hopefully for the dawn of a brighter day.

There is bound to be a reaction following this wave of economy. There is bound to come a time when harsh and drastic measures of economy must cease or they will become destructive, and there is bound to come a time when the people themselves, no longer over-influenced by those who are trying for unreasonable economies, will come into the realization of their own power and the necessity for its use and simply put the radical and unreasonable economists out of business.

This country is going to have an army and it is going to be along the general lines laid down in the amended National Defense Act of June 4, 1920, and the public is going to support that idea when the public more thoroughly understands it, and, may I say, when the public gets more and more closely and familiarly in touch and understanding of its own army and its own army people.

For my part, I think it would be a wise thing if the army went quietly about its business for the next few years, sought every proper means of showing its own inherent worth, both to government and the people, cleaned its house wherever necessary, both in personnel and in customs, and then found itself ready to take advantage of the turn of the tide. And the tide will surely turn.

That, surely, is advice upon the wisdom of which we may rely in all confidence—the advice of a friend in the Congress who has a unique understanding both of the conditions that confront us and the manner and spirit in which they should be met; that is, philosophically to accept the conditions as we find them; get

down to work and make the best of the material situation, redouble our efforts in training, in instruction and in the development of military character; and through it all remain cheerful pending the time when, as Mr. Greene says: "the people themselves, no longer over-influenced by those who are trying for unreasonable economies, will come into a realization of their own power and the necessity for its use and simply put the unreasonable economists out of business."

Let nothing in this paper be construed as implying any lack of confidence in the ability of our personnel to stand up under even more trying conditions than the present. My object in writing it is chiefly to present a brief review of our navy's much more serious troubles in the past, from the point of view of one who has actually experienced them, and to contrast these former trials with those of the present in order to make it clear that the worst is not yet to come; that never again can we reach such a low ebb in intellectual or material development; that never again shall the service be arrayed against the study of the art of war; that never again shall our navy build ships whose designs violate both military requirements and common sense; that the life blood of the navy is its personnel; that its soul is the mind of the individual; and that the people may rely upon us to keep that mind at all times in such a condition of training and morale as to make the best of any material conditions that may be imposed upon us.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TORPEDO PLANE AND BOMBER

By Rear Admiral Bradley A. Fiske, U. S. Navy

The bombing experiments that were conducted last summer off the Capes of the Chesapeake, the success that attended them, and the world-wide publicity that was given, added to the fact that the torpedo plane was not tried in the experiments at all, have inclined many people to infer that the torpedo plane has been declared a failure, and relegated to the classic shades of limbo.

Many officers, however, though they realize the importance of the bomber, think that the torpedo plane is at least equally effective. Their reasons are based on the following beliefs:

1. A belief that (by night or by day) the chance of hitting with a torpedo is greater than that of hitting with a bomb, the distance, of course, being the same.

2. A belief that the damage done by a torpedo, when it hits, will be as great as the damage done by a bomb of equal weight, when it hits, or falls alongside.

3. A belief that (by night or by day) it is easier to hit a bomber with anti-aircraft guns when it reaches its firing position than to hit a torpedo plane when it reaches its firing position, the distances being the same.

4. A belief that (by night or by day) it is easier to prevent a bomber from getting a good aim than to prevent a torpedo plane from doing so, the distances being the same.

Taking these items in succession:

1. A long theoretical argument can be made to prove that there is a greater probability of hitting with a torpedo than with a bomb: based largely on the fact that the torpedo runs at a constant depth. It seems more convincing, however, to point out that the percentage of hits in the bombing experiments last summer was considerably less than the percentage of hits actually

made by torpedo planes in recent practices, although the distances from the target were less in the bombing experiments than in the torpedo plane experiments.

Before leaving this aspect of the question, I beg leave to remind the reader that a detailed statement appeared in certain important British papers (and was never denied to my knowledge) that, in the latter part of 1919, a squadron of eight British torpedo planes, under cover of a smoke screen made by two bombers that preceded them, made a simulated attack on a British fleet in Portland Harbor and scored six hits with dummy torpedoes! Seventy-five per cent hits.

2. As to the relative amounts of damage done, we may disregard attacks of small bombs dropped on vessels; because, although such attacks will be very formidable, they will probably not constitute major attacks, but rather minor attacks intended to demoralize the personnel, preliminary to major attacks by large bombs and torpedoes.

Probably no officer would question the declaration that the detonation of a torpedo in actual contact with the hull would do more damage of a purely local character (that it would cause greater actual penetration of the hull) than the explosion of a much larger amount of explosive a few feet away. Assuming the charge in a 1,600-pound bomb to be four times as great as that in a 1,600-pound torpedo, and the center of the charge of the torpedo to be a foot away from the hull, the penetrating effect of the bomb would be about the same, if the center of the bomb were two feet from the hull. Unless the bomb fell not more than two feet away, therefore, the torpedo would have the greater penetrative effect.

If there were no other effect to be considered, therefore, we should feel safe in declaring that a torpedo hit would, in nearly every case, be more effective than the explosion of a bomb, unless the bomb fell not more than two feet away. But the case is not so simple as this; for the reason that, besides the actual penetrative effect, there is a sort of water-hammer effect, which causes a great pressure over a considerable area, and does a damage in opening seams, etc., which varies with the charge, distance from hull, depth of immersion, strength of structure, etc., etc., etc. So complicated is the question, that no one yet has seemed quite able

to reach a decided opinion as to the relative damages done by a torpedo that hits the hull, and a bomb that explodes near the hull. That a torpedo plane can sink a first-class superdreadnought is apparently the opinion of Mr. Hector C. Bywater, who stated in the *Naval and Military Record,* of February 16, 1921, "Last week she (the German superdreadnought *Baden)* was bombarded at short range by gunfire, and afterwards attacked by torpedo planes; with the result that she now lies on the bottom of Spithead in shallow water, where she can be salved for further tests."

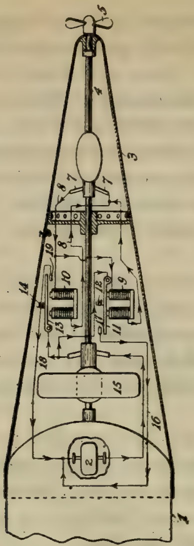
In studying this problem, about three years ago, I concluded that it would be best to cut the Gordian knot, and devise a scheme that would ensure the explosion of the torpedo directly beneath the ship. If this could be done, the maximum effect of the detonation would be secured—an effect that no ship whatever could withstand.

I knew, of course, that attempts had been made to do this by means of so-called "magnetic pistols" and similar devices; but I realized that any attempts to move pivoted magnets by the magnetic force of the hull, could hardly hope for success, because of the small forces brought into play.

So, I devised the scheme shown in the cut, whereby the puny force of a magnetic needle would be replaced by a force which could be made quite large; a force created by the rapid revolution of an armature made of many turns of wire.

In the diagram, a brass casing, 3, is shown secured to a warhead, 1. This casing carries a rotator, 5, which is continuously turned as the torpedo goes through the water, and therefore turns the shaft, 4, and an armature shown as an ellipse in the diagram, besides the armature of the little dynamo, 15. The current generated in the first armature by its revolution in the earth's magnetic field is too small to actuate the relay, 10; but if the torpedo reaches the strong magnetic field that exists under an iron ship, the current will so increase as to close the relay, 10, and send the current of the dynamo, 15, through the fuse, 2.

To take care of cases that might possibly arise, in which the field under the ship were of such a sign as to decrease the field, the relay, 9, is provided. It is so adjusted that if the current through it weakens, it will release its armature, and thus send the current of 15 through 2.



IGNITION SYSTEM FOR TORPEDOES

About three years ago I suggested this scheme to a number of torpedo officers and ordnance officers; but as nothing came of it, I finally patented it and put it on the same "waiting shelf" with a number of other schemes. I cannot see why any competent electrical engineer could not make this work in a month, at the most; and neither can I see why it is not the best scheme yet proposed for getting the most out of torpedoes. Certainly, it seems too important to be neglected. The patent was finally issued on May 31, 1921.

3. Coming now to the relative degrees of ease of hitting bombers and torpedo planes, let us realize that the defending ship knows the exact line (almost directly above it) to which the bomber must come, and can keep its anti-aircraft guns trained on that line and wait. And let us also realize that no one can tell even approximately the point at which a torpedo plane is going to launch its torpedo.

I find in talking with officers, that some of them picture a torpedo plane as coming from directly abeam, and the ship raising

a barrage of splashes ahead of her. But suppose the torpedo plane comes from ahead, swoops down and fires from directly ahead at a range of two or three hundred yards. Or suppose she comes from ahead, makes a feint to the port side and then suddenly shifts to the starboard side, and fires from about four points on the starboard bow. An airplane is so exceedingly mobile that a practiced aviator can perform such feats with ease.

We have thus far considered the individual ship as a target. Let us consider now the case of a fleet in formation, and suppose that a hundred torpedo planes fire their torpedoes (say at daylight) from positions on both bows, and five miles distant.

Problem: You are C. in C. of a fleet, about 200 miles from the enemy's coast. Contact with the enemy fleet seems probable, and you have your fleet in formation. Shortly after daylight, great numbers of airplanes are seen on both bows, about five miles distant. Soon, they seem to be flying away, toward the enemy coast. Ten minutes afterwards, great numbers of torpedoes pass through the formation, and five of your ships report that they have been torpedoed. *What do you do?*

"I would signal ships right (or left) as soon as the airplanes were sighted; and besides the fleet would be zig-zagging"—would be a ready answer.

But such maneuvers, while highly effective against submarines, because of their short range of vision and slow speed, could not long be effective against torpedo planes; because of their long range of vision, greatly superior speed, and consequent ability to divide into groups, and discharge torpedoes from several directions at the same instant.

It is difficult to imagine what effective measures a C. in C. could take or how he could refrain from adopting the purely defensive policy of continual dodging. Unless the lessons of history are misinterpreted by strategists, such a policy could not possibly lead to anything but ultimate disaster.

Clearly, a C. in C. of a fleet, attacked by torpedo planes near their own coast, could hardly expect to drive them away with pursuit planes, for the reason that the enemy would probably have more pursuit planes than he had.

4. Let us briefly consider now the problems of preventing accurate aim by torpedo planes and by bombers.

We realize at the start, of course, that if a bomber be prevented from dropping at the critical instant, he loses his chance altogether on that run, and must fly off and try again. Remember, the critical instant is really an instant; certainly it does not last more than a second. A torpedo plane, on the other hand, can fire at any time when the range is not too great.

Furthermore, during the critical period, the speed of a bomber must be absolutely uniform and the direction straight; for otherwise no spirit level or pendulum *or even gyroscope* can indicate the vertical correctly. The whole sighting apparatus of a bomber is based fundamentally on a correct knowledge of the vertical; so that even the slightest interference, by causing a change of course or speed, will prevent an accurate shot. The torpedo plane is subject to no such limitations. Provided that the range is not too great, it is merely necessary to point the torpedo at the target with the correct allowance for speed of plane and target, and the torpedo will do the rest. It is not necessary to fire at an exact instant. And the torpedo can make only one of two mistakes; it can go to the right or to the left. But a bomb may make a mistake to the right or the left, and at the same time over or short.

It is interesting to imagine also what would happen if anything were done on board the target ship, just before the bomber reached it, that would prevent a clear view of the deck. In such a case, the bomber's aim would probably be quite inexact. For instance, suppose that every time a bomber approached too near, twenty diminutive mortars threw a few rounds of smoke bombs directly up, so that they would explode about 500 feet above the deck, and make a horizontal smoke screen.

I trust that no one will construe what I have written as indicating a non-belief on my part in the efficacy of the bomber. I think that both are necessary in their respective spheres. "I like both ze white wine and ze red." I am merely trying to call attention to a weapon the importance of which, I think, has been underestimated.

I trust that the fact that I am the inventor will not unduly prejudice my case, in the mind of the reader.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE NEW FAR EAST DOCTRINE

By Commander C. C. Gill, U. S. Navy

The Washington Conference, 1921-22, met to stop the race in naval armaments and to compose difficulties in the Far East. Few people will deny the history-making significance of the treaties which were evolved. A common understanding has been arrived at as to general procedure in the development of Eastern Asia; dangerous competition has been curbed; the menace of unfriendly rivalry has, for the time being at least, subsided; and the naval race in building costly capital ships has been temporarily and perhaps definitely stopped. These are indeed great achievements. Similar conferences for similar purposes have been held at various times in the past, but never before has one been crowned with such spectacular results. This fact in itself is food for thought.

In order to understand the treaties and the new Far East Doctrine enunciated, it is necessary to comprehend the naval strategy of the Far East. The aim of strategy is control of the sea, and the influence of this principle of sea power in national growth and prosperity is now universally recognized. It operates, both in time of peace and in time of war. The pages of past history testify the influence of sea power; and events of more recent years add striking illustration. In the World War it was control of the sea that made possible America's decisive blow, launched 3,000 miles across the Atlantic at the critical time, at the critical point; and again, both at the Peace Table and at subsequent international conferences, witness the power of arguments backed by potential naval strength.

This was particularly true of the Washington Conference. The undeveloped treasure-house of Asia bids fair to make the Far East a future center of great commercial activity. Con-

trol of the ocean routes leading to the Orient has become a vital question. The strategy involved has received close attention and here we find the cause of the race in naval armaments. Sea power, therefore, was the main theme of the Washington treaties and considerations of strategy were in high control.

When the United States assumed a moral leadership and called this conference, the most dangerous menace to peace in the Far East was the prospective clash of policy between America and Japan. The latter country had taken advantage of conditions created by the World War to push forward a plan of aggrandizement in continental Asia. During the last twenty years Japan has brought under more or less effective control about 1,500,000 square miles of Eastern Continental Asia, peopled by about 50,000,000 non-Japanese—exclusive of Shantung. This Japanese program has conflicted with the open-door policy of the United States. Great Britain and France are also interested parties in the Far East, but their hands have been, and still are, full of more pressing business in other quarters. Russia, for the time being, is only a passive factor. This leaves the United States and Japan the chief actors in the Far East.

To assist the comprehension of Far East strategy, the case of the United States and Japan may be taken as an example. For the purpose of discussion, we might assume that the Washington Conference had not taken place, and that rivalry between these two countries had been allowed to develop. Under such circumstances, the first step in strategy would be to determine the political objectives of the rival powers, and the kind of war likely to result, if resort should be made to armed force. It might be reasoned that the aim of Japan would be to gain a free hand in her scheme of aggrandizement in the Far East, and the aim of the United States would be to maintain the open-door policy and thwart unlawful aggression, inimical to American interests. A war arising over these objectives would not be *unlimited,* as was the 1914-18 struggle between France and Germany, but would be what is technically known as a *limited war* —more like the Russo-Japanese conflict fought in the early part of this century. It will be recalled that in that war there was very little fighting in either Russia proper or in Japan proper; activities were confined to the sea and to the disputed area in East

Asia. So in the war of our assumed case between the United States and Japan, the latter would have no idea of invading United States continental territory; such a step would involve a hazardous and expensive campaign unnecessary to the attainment of her purpose. On the other hand, the United States, to gain her war objective, would be compelled to go to the Far East and forcibly stop Japanese aggression. The objectives being entirely in the Far East, the issue would have to be decided there. Such minor questions as discrimination in California against Japanese would play a part in arousing sentiment for war, and might be the spark to set it going, but could hardly assume importance enough to comprise a political objective for which alone the two nations would engage in active hostilities.

Assuming now that active war has ensued, what would be the preliminary strategic moves respectively of Japan and the United States? In the principal theater of this limited Far East war, Japan would be at great advantage as to position. In her own country, both the army and the navy would be centrally placed; her main fleet could be conveniently based secure in the Inland Sea, and operating from there, could successfully control home waters and dispute control with any hostile fleet advancing within a radius of 1,500 miles or more. The most probable strategy of Japan against the superior naval strength of the United States would be an *offensive-defensive,* similar to that used by Germany in the recent war against Great Britain. Japan would not at once risk a capital ship encounter to a finish, but would harass the approaching enemy with torpedo, mine and bomb, would give battle only on terms of advantage, and would try to wear down the superiority of the United States Fleet, until a general engagement could be fought with a fair prospect of victory. In this strategy her chances of ultimate success would be more favorable than were those of Germany against Great Britain in the World War, because the United States would be at the disadvantage of operating in waters 6,000 miles from home bases.

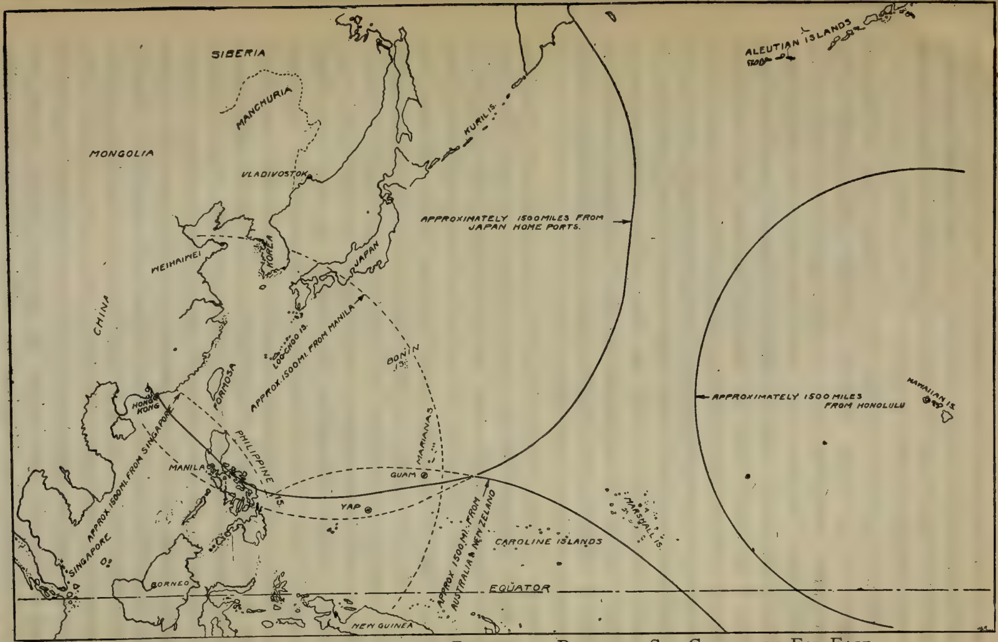
Under the assumed conditions, with tension between the two countries increasing, it may reasonably be supposed that before the breaking point were reached, the United States would take steps to protect her Far East possessions. It is interesting to recall that last year the Senate passed a bill to fortify Guam,

but this measure was held up in the House because of public sentiment for a reduction of armaments. With Guam impregnable, it is doubtful whether Japan would try to occupy the Philippines, and if she did, she could later be made to relinquish them by means of combined land and sea operations launched from Guam. On the other hand, with these islands in their present vulnerable status, Japan could and undoubtedly would, capture them before our fleet could arrive to protect them. This would give the United States a much more difficult nut to crack.

In any event, a *sine qua non* for the United States to bring naval pressure against Japan would be an adequate base within striking distance of the main theater of the war. With our fleet based no farther west than Hawaii, Japan could seize the Philippines and Guam, and generally speaking, work her will in the Far East. To win our war objective, we would have to advance to the Far East and establish there an adequate base from which to carry on offensive operations against the enemy. Japan in her home bases would be as secure as Germany was behind Heligoland; and, in order to conduct a successful campaign against Japan, the United States would have to establish a Far East base like "Scappa Flow," with protected communications, adequate docks, arsenals, repair facilities, fuel supplies and other resources. With the navy securely based there, we would then be in position to get ready expeditionary forces and consolidate our strength preparatory to the next offensive steps.

It is not wise to project strategy too far into the future. Successive moves depend largely upon contingent developments. The aim of the United States would be to draw closer the cordon around Japan. As soon as Japan's communications could be effectively interrupted, the pressure of the blockade would begin to be felt. A stage would eventually be reached when the Japanese fleet would be forced to come out and fight our main fleet, and the issue of the war would hang on the result of the battle. It should be added that Japanese strategy would hope by attrition to overcome American superiority before this battle.

But it is not necessary to go into details of strategy to understand its relation to the peace treaties. It is enough to note that the exercise of naval power depends upon position; that the needs of a modern fleet tie it to naval bases; that to control



SOLID CURVES INDICATE APPROXIMATE DIVISION OF POTENTIAL SEA CONTROL IN FAR EAST
AS DETERMINED BY WASHINGTON TREATIES

any given sea area a navy must have an adequate naval base within striking distance of that area. For our present purpose it suffices to grasp this fundamental principle in its application to the strategy of the Far East.

Draw a circle with Manila Bay as center, with an assumed radius of 1,500 miles. This gives a fair approximation of the area which would be influenced by a superior fleet based in the Philippines. In case of a Far East war, it is obvious that Manila Bay would prove an admirable location for a main naval base from which to radiate subsidiary advance bases and exert control over the principal trade routes to China and Japan. It is at once seen that with a superior fleet and an impregnable Guam–Philippine base, the United States would control, potentially in peace and actively in war, the door to the treasure-house of Asia. But, by the agreements of the Washington treaties, the United States has given up her right to take advantage of this strategic position. (See chart p. 1483.)

From a strategic point of view, the most noteworthy provision in the Washington treaties is the agreement by which the *status quo* as regards fortifications and naval bases in the Pacific is to be preserved. Japan has agreed not to strengthen her outlying possessions; of these the most important islands, Formosa, the Loo Choos, the Bonins, and the Kuriles, are all within the radius of protection of her battle fleet based in home waters; the mandatory small islands north of the equator, acquired by the Versailles Treaty, fall outside this radius, but they have little economic value: Japan does not give up control of important possessions or of important interests. Great Britain has agreed not to strengthen Hong Kong, but has retained the right to establish fortified naval bases at Singapore and in home waters of Australia and New Zealand; Hong Kong is within the protecting radius of the fleet operating from Singapore (by another agreement Wei-Hei-Wei on the Yellow Sea is returned to China); Great Britain's interests and Great Britain's possessions are safeguarded in accordance with the principle of sea power. The United States has agreed not to strengthen her Island Possessions west of Hawaii; these include the Aleutian Islands, Guam, and the Philippines; the Aleutians are within the protecting radius of a fleet operating from United States continental ports, but

the valuable Philippine Archipelago and the strategically important island of Guam, both of which are at present inadequately fortified, fall far outside the protecting radius of a fleet operating from Hawaii: unlike Great Britain and Japan, the United States has abdicated the right to exercise potential control over important possessions and important interests.

The most far-reaching result of the Washington Conference seems to be that taking the naval treaties in conjunction with the Four-Power Treaty and the Nine-Power Treaty they enunciate a new Far East Doctrine. This doctrine is one of non-interference, which leaves Japan in potential control of the North West Pacific and Great Britain in potential control of the South West Pacific, while the potential control of the United States extends only about 1,500 miles west of the Hawaiian Islands. (See chart p. 1483.) To be sure, the agreement is only for ten years, but a doctrine that stands for ten years is very likely to become permanent. This new Far East Doctrine, as it bears upon Japan and the provinces of East Asia in their relation to other powers, has points of resemblance to the Monroe Doctrine in its bearing upon the United States and other American republics in their relationship to trans-oceanic countries. There is, however, one important difference—the Monroe Doctrine although tacitly recognized, is not formally conceded, and we must stand ready to fight for it, whereas the new Far East Doctrine is guaranteed by formal international agreement. Japan has struggled long for domination in the Far East and now, through diplomacy backed by her powerful navy, she has achieved her ambition.[1]

It is thus seen that our statesmen at Washington did not achieve great ends without making concessions. The United States has set an example. The question is, will other nations follow it? There is a danger that we may be misunderstood. Our hand is weakened in the Far East by this abdication of potential strategic position. With the right to exert the pressure of armed force thus lessened, we must watch closely to note the efficacy of arbitration and conference to safeguard our Philippine possessions, to protect our commerce, and to insure right dealing in China

[1] It is significant that Admiral Kato, Chief of Staff to Admiral Togo in the Russo-Japanese War, Minister of Marine 1916-22, and astute negotiator at the Washington Conference 1921-22, has now been promoted to the post of Prime Minister for Japan.

and Siberia. If there are nations still inclined to unscrupulous aggression, it would be harmful, not helpful, to the cause of peace to lead them to believe that to avoid war the United States is ready to take successive steps of withdrawal in the Pacific. Such a course would only serve to pile up trouble for future generations. Hence, forward-seeing statesmen vigorously oppose drastic slashing of our army and navy. The United States has given substantial evidence of good-will in settling international differences. Common prudence demands that we halt here and observe results before initiating a second step in disarmament by example.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PROMOTION BY SELECTION

By Lieutenant Commander W. C. Barnes, U. S. Navy

The system of promotion by selecting up will in time tend to:

1. Create a system of bureaucracy thoroughly un-American in principle.

2. Destroy the independence of thought and action in our high ranking officers.

3. Break down the *esprit de corps* of our officer personnel.

I

The placing in the hands of a small group the power to perpetuate themselves and their ideals is bureaucracy. Selection up enables a group of leaders in Washington to select those who would fill their places and eliminates any element among the high ranking officers who think differently upon any important subject. To perpetuate their policies this group can build up around themselves a coterie of followers whose service would become personal service rather than independent service to country and lofty ideals. The reward for servility would be promotion, the penalty of independence, oblivion.

Selection up is sure to lead to self-sufficiency, complacency, self-satisfaction, and arrogance on the part of the bureaucracy, and indifference on the part of the rank and file. It will produce a group of pleasing, tactful, safe men; in some cases, able administrators, but it will not develop the fighting, restless Nelson or Farragut.

Such a system is un-American and a menace to national safety. It takes no wild flight of fancy to imagine the control of the navy in the hands of a group of officers whose policies are born of national or racial prejudices, and whose actions, protected from just criticism, would plunge the nation into a disastrous war.

II

In the words of a noted member of the American bar, "The friction of two minds causes the truth to scintillate."

Any system of promotion that stifles the independence of thought and action of an officer when he has reached the age of mature judgment is harmful to the progress of the navy, and will not develop the vigorous combative natures essential to success in naval warfare.

The self-perpetuation of a group of leaders, and the lowering of the independence of thought and action is the danger that must be faced, and is so great that it destroys the value of the system of selection up. It stifles the very characteristics that have given great naval leaders to the world. Such men are not desk officers, they are not men to bow the knee to any man and declare him always right. It is well known that the greatest advancements have been brought about by strong criticism by independent self-reliant men.

Promotion by selection takes away the independence of an officer at the time in his career when his judgment is mature and he is best suited to express his opinions in the nation's council.

To be a protagonist of a certain viewpoint naturally makes you an antagonist of the contrary position. Where the promotion of an officer lies in the hands of the opposite party, then that power does kill the independence of thought and action.

Any system of promotion must tend to develop the higher qualities in the men who will conduct the navy in battle. The characteristics of such men can only be arrived at by studying the great leaders of the past wars. It is notorious that men have made great mistakes in selecting men for such positions. The great leaders have been practically unknown until brought forward by adversity. They have not been the men popular with the bureaucracy nor men whose characteristics were pleasing to those who were higher up. In the Mexican War, Farragut applied for duty and set forth a plan of attack—his letter was never even acknowledged by the Department. Such a type of man does not seek to curry favor nor bow down to temporary authority. He respects authority, but does not see anything infallible in any man. The system of selection up is a system that is bound to be antagonistic to the fighting qualities.

III

The *esprit de corps* of the officer personnel depends upon co-operation and respect for proven abilities.

It has been stated that the men in power will surround themselves with sycophants whose ideals are inspired by selfish motives rather than devotion to the service and the nation.

The subordinates know that their advancement can only come through the good will of a certain number of the members of the inner shrine. They attach themselves to the following of one of this group, and use all their influence and power to support these individuals. The more influential friends, the more private means, the more skill in propaganda, the greater will be their success in being selected up to perpetuate themselves and their inherited policies.

With such a system, suspicion and jealousy of the earned recognition of a brother officer is bound to creep in. Even now we have the subtle propaganda, the rumor, and the whispered word in the ear.

It is well known that a capable officer of high rank was delayed in promotion several years through a rumor that was proven false, and he has not yet been restored to his place. Injustice once done can not be remedied and this though there was nothing on that officer's record to substantiate the charge.

Selection up is a system that cultivates servility instead of subordination. The attitude of the service toward it is shown by the action of an officer ordered to duty under a higher officer. His first action on learning of the orders is to make inquiry as to this officer's personal hobbies and prejudices. How trifling all this is! What difference should it make whether a higher officer has any personal hobbies or prejudices? Personal service lowers the ideals of our profession and our self-respect.

When an officer stoops to gain the good graces of his superiors to gain promotion, he loses the respect of his subordinates. When promotion is influenced by personal favors, simple acts of courtesy cast a suspicion in the minds of brother officers, that those acts are performed for personal gain.

When rumor and suspicion enter into the lives of naval men, the *esprit de corps* is shattered.

SELECTION

There is always a natural selection going on in the lives of naval officers as well as other men. Death and illness create a certain flow of promotion.

Many men from lack of interest in their profession or intemperance eliminate themselves. They could be selected out if the reporting seniors could express their honest opinions without fear of jeopardizing their promotion by antagonizing political powers.

The selection should take place in the lower grades, transferring the officers into the reserve with equitable compensation as now is the case with the enlisted personnel. The selection out in early life would give a man a chance to take up a new line of work.

Selection out saves a spirited man the humiliation of being passed by his juniors. A discredited officer cannot command respect, nor inspire the confidence of his command.

After reaching command rank, promotion should be by seniority. The feelings and spirit of an officer should not be hurt by being passed over after they reach the position where they stand out as individuals. It should be a cardinal principle that an officer's seniority should not be changed after he reaches mature years.

At that time in his life he should have the greatest possible independence of thought and action without fear of punishment outside those prescribed by the Articles for the Government of the Navy.

When a man's character and principles stand out, it enables those entrusted by the people to govern the nation to pick the men best suited to carry out national policies.

Selection for duty rather than selection for promotion is the true selection that carries with it no jealousy, injustice, or hatred, and will build up the character of the men who must preserve the nation in future conflicts.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVAL CORPS, SPECIALIZATION AND EFFICIENCY

By Lieutenant Commander T. C. Kincaid, U. S. Navy

Much has been written in the past few months in connection with the special functions of the various naval corps, shore duty only, amalgamation and other kindred subjects having to do with the organization, duties and education of the officer personnel of the navy.

Promotion by selection and other methods of promotion have been analyzed and discussed and a board of officers of high rank has been appointed to consider recommendations on this subject. The method of promotion has, and always will have, a direct bearing on the duties, training and education of officers. Under one system specialists may thrive, while under another the jack-of-all-trades-master-of-none may have an advantage; and still another system may develop a good all-around naval officer who is particularly well informed in one line of endeavor.

Many of the articles written on these subjects have been inspired by arguments in which glittering generalities formed the basis of the discussion, bringing forth false conclusions, which are not borne out by careful analysis. The old corps jealousies and after-war hysteria are not entirely lacking in what we read.

That specialization of some sort is necessary can not be doubted and the number of pro-specialists in the service has noticeably increased in the past few years, as a result of observations afloat as well as ashore. This faction should not be entirely discouraged for their ideas are based upon fundamentally sound arguments, but their ideas should be carefully sifted and weighed against each other in order that the kind of specialization that will do most good, and least harm, will be obtained.

Corps specialization is decidedly unpopular, the feeling being general that special corps are both unnecessary and undesirable. The service would be far better served by specialists within the line who go to sea and operate the material of which they supervise the construction when ashore. The naval constructor and the permanent engineer are not the actual designers of material. They are supervising designers and the run-of-the-line naval officer can be trained to do just the work that these specialists do. In fact, the line officer has the advantage of practical experience afloat and is able to consider recommendations and criticisms from a broader point of view than the corps specialist who has remained on shore duty for several years.

The fact that line officers, after a special course of instruction, can successfully supervise the design of complicated mechanism has been demonstrated by the Bureau of Ordnance. There is no more complicated design work than that of a gun and its appliances. During the past few years enormous strides have been made in the development of ordnance material and all of the design work has been supervised by seagoing line officers. The development in fire control mechanism could not have taken place without the direct contact of seagoing officers who had a thorough, practical knowledge of the problems to be solved. The design of new material may be divided into two general functions; first, a clear-cut statement of what the mechanism is to accomplish, giving its general characteristics, followed by a critical inspection of the actual designs; and second, the actual calculation and arrangement of parts. The first of these functions can best be done by a line officer specialist who is familiar with practical considerations connected with operation and who knows what part this particular mechanism is to play in the operation of the ship as a whole. The second can be accomplished only by a designing engineer of whom there are plenty available in the drafting rooms of various naval establishments and outside contractors.

Specialists are required at sea as well as ashore. It is obviously impracticable and impossible for any individual to be expert in all the varied subjects of which an efficient naval officer is required to have a working knowledge. The officer who works up in the Gunnery Department through all the stages required to give

him a thorough knowledge of operation, procedure and doctrine, should be an expert gunnery officer, but the efficiency of the ship as a whole would suffer if he were detailed as navigator or chief engineer. In the same way, the trained engineer could not be expected to make an expert gunnery officer. The officer who flits from one department to another can not be an expert in any one line of endeavor, and certainly not in all lines. This does not mean that the average naval officer can not "get away" with a tour of duty in any department on board ship. The untrained gunnery officer or chief engineer may finish a cruise without court-martial and the ship may even stand fairly well in competition, but it is certain that maximum efficiency will not be attained and very little development can be hoped for if the heads of department on board ship are not specially trained men.

It is only natural that officers who specialize in the production of a certain type of material ashore should specialize in the operation of that material afloat. By such a system complete co-operation between the designers and operators of material should be obtained and maximum efficiency afloat should be the result. Continuous and progressive advancement of the multiplicity of arts, industries, and sciences connected with a naval officer's career can be obtained only in this way.

The establishment of seagoing corps would not accomplish our object. We would then have the old corps jealousies and narrow points of view. But that is not all. Teamwork would be extremely difficult, due to lack of understanding and sympathy between the officers in charge of the various stations in the ship. This was demonstrated years ago and was one of the causes of the abolition of the Engineer Corps. Each department on board ship, and each subdivision of each department, is merely a unit in an organization which must function as a whole. Each unit must not only perform its own function but must do so at the proper time and in such manner as will fit in with the other units for the efficiency of the whole organization. It is necessary that the commander of a unit have a working knowledge of the functions of other units and of the general scheme of operations of the whole ship's organization.

One line of endeavor in which specialization is greatly needed is that of administration. A flag officer generally selects his staff

from among the younger officers of his acquaintance in whom he has confidence, but these officers, until they have served on a staff, are entirely untrained for the special type of duty they are called upon to perform. There is no school of instruction for prospective members of a flag officer's staff and the officers selected are, in many cases, too young to have had the experience necessary to perform their duties efficiently. The details of administration can not be followed personally by the flag officer and important work, of a widely varied nature, is delegated to officers who have had neither the experience nor the training to properly perform such work. The result can only be inefficiency in administration.

For a number of years there has been a demand in the service for a greater number of school days for officers. The advance in technical subjects has been so rapid in the immediate past that the Naval Academy is no longer able to complete the education required for an officer.

The course at the Naval Academy lays a foundation upon which to build. It is excellent preparation for inferior subordinate duties. After about five years at sea, all officers should return to the Naval Academy for a period of one year for a postgraduate course in general line duties. At this period in his career, the officer has had an opportunity to test the theories learned at the Naval Academy; has had the responsibility of a watch, either on deck or in the engine room, or both; has occupied a position of more or less importance in the battle organization of a man-of-war; has profited by contact with older and more experienced officers; has developed a sense of responsibility and pride in the service; and usually has a definite preference for one line of work. His age and experience make his powers of learning vastly greater than during the initial instruction period at the Naval Academy.

The function of the general line course is the confirmation of initial instruction and the progressive and advanced instruction in preparation for duties of a higher order, laying emphasis on the subjects in which all line officers must be expert. Every line officer in the service should be an expert navigator and an expert seaman; should have a thorough knowledge of the laws governing the navy and the U. S. Navy Regulations; should have a thorough understanding of the organization and relative func-

tions of ships, shore stations and the Navy Department. A detailed outline of a proposed general line course was submitted to the Bureau of Navigation by a board appointed to consider the instruction and training of line officers and the report of this board was published in the PROCEEDINGS, U. S. Naval Institute, for August, 1920.

Immediately following the general line course, specialization should begin. If practicable every line officer should specialize and become highly expert in one branch of work. The specialist's course should correspond to the present postgraduate courses for line officers in ordnance and engineering and there should be added courses in naval construction, aviation, and administration. The length and nature of these courses would be determined in accordance with the requirements in each case.

After completion of this course, the line-officer-specialist would go to sea and be assigned to duty in connection with his specialty, and subsequent shore duty should follow the same line of work. This should not be an ironclad rule, as all line officers should be available for assignment to any line duty, but it should be the general rule followed in ordinary practice. When an officer had attained the proper rank for superior subordinate duties, he would become head of a department in which he had been brought up and his previous training and experience would insure not only proper performance of duty in a routine way, but aggressive performance of duty tending toward advance and development.

The next step in the education of the line officer is the Junior War College course which should be taken by all line officers after about twenty years' service. All specialists are again placed on a common footing, studying the principles of command and many important phases of tactics and strategy in preparation for duty as second in command of capital ships and commanding officer of smaller fleet units. All line officers would then have a common conception of war and would be uniformly indoctrinated. The senior members of a flag officer's staff would be competent to do strategic planning and to formulate doctrines.

Graduates of this course should be assigned to duty in accordance with their relative rank. Graduates who have not rank enough to be second in command of capital ships or to command cruisers or gunboats, should be assigned to command destroyers

or to superior subordinate duties in connection with their specialties on capital ships until such time as the necessary rank has been attained. Shore duty at this period should be of an administrative nature and may or may not be in connection with a specialty.

After completion of a tour of duty in command of a capital ship or group of smaller ships, officers who will attain flag rank should be detailed to take the Senior War College course. All captains should, if practicable, take this course, but, if the number is limited, only those officers who it is expected will be selected for promotion should be allowed to take the course. If promotion by selection remains in effect, the Selection Board should designate the officers to be detailed for this course if there is to be a limited number.

The Senior War College course should teach the higher elements of the profession which concern chiefly those principles that govern in the administration, operation and functions of forces and fleets. Without such a course, a flag officer can not hope to function at maximum efficiency. If a flag officer is promoted without having taken the senior War College course his first assignment to duty in his new rank should be at the War College. With the above system of instruction in effect flag officers would not be properly trained themselves but would be able to surround themselves by specially trained, competent staff officers to whom important duties could safely be entrusted. The president of the Naval War College should be required to furnish all graduates of the Senior War College course with a semi-annual letter, or pamphlet, setting forth all developments in the preceding six months in order to insure flag officers of several years' standing keeping up to date.

Many of the after-war difficulties which the service has experienced during the past three years are of a temporary nature, and will cease to give trouble as time goes on and the service settles down to a routine scheme of training a definite organization of men and ships. These difficulties, however, have served to strengthen the arguments of the pro-specialists and have convinced many officers, who did not believe it before, that specialists are essential to efficiency in the operation of our ships.

Within a few months after this country entered the war practically every gunnery officer in the fleet had been detached and

their places were filled by much younger officers. These officers, however, were essentially gunnery specialists having been thoroughly indoctrinated in the gunnery departments of the various ships in the fleet. This made possible the era of advance and development in gunnery which took place in our fleet during the war period. Within a few months after the signing of the armistice, practically all of these officers had been detached and, in order to have commanders as heads of department, older officers were ordered in their places. Many of these officers had been out of touch with gunnery for years and had great difficulty in catching up with the war developments. Expert submarine officers, destroyer commanders, and officers who had been serving on the staff of a flag officer found themselves woefully lacking in the knowledge and training necessary to drill and operate a ship's battery. Advance and development in gunnery were almost negligible and many of the lessons learned during the war have been lost.

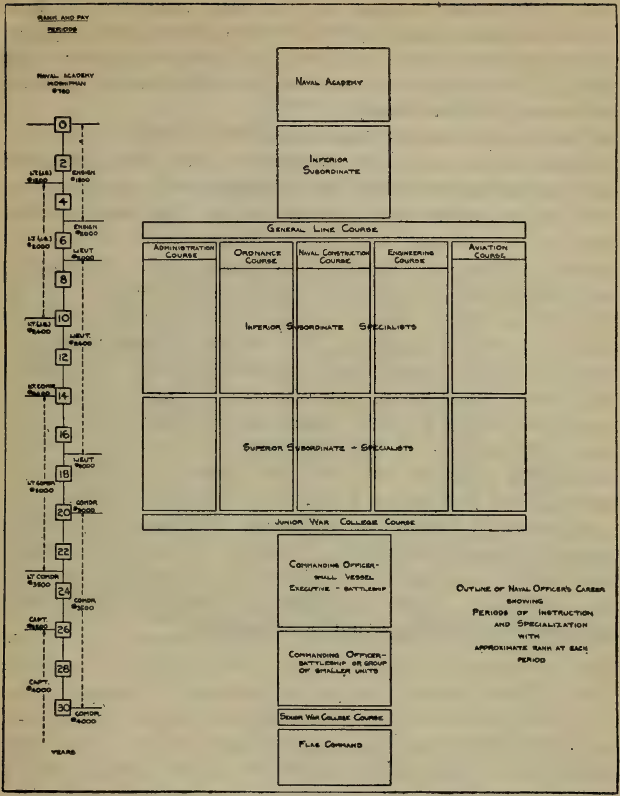
Much difficulty has been experienced in the operation and upkeep of the engineering departments on board ship during the past few years because of the lack of specially trained engineers. New destroyers, just built and commissioned, have been found after a few months to be in very poor condition due to inefficiency in operation and upkeep. Conditions afloat have been a matter of grave concern to the Bureau of Engineering, so much so, that compulsory instruction in engineering for a certain number of hours a week for all officers on board ship below the grade of lieutenant commander was recently considered. This condition will correct itself in time but it indicates clearly the need of specially trained officers—specialists. The immediate remedy for such a situation lies within the fleet itself. Within a few months vast improvement can be made by systematic instruction and indoctrination through the medium of fleet meetings and lectures, similar to the system employed in the Atlantic Fleet in connection with gunnery during the war.

Part of the difficulties in engineering are due to the permanent engineer. When the assignment of officers to duty in engineering, only, with perpetual shore duty after reaching the grade of commander, was being considered, there was doubt in the minds of many officers as to the advisability of applying for this assign-

ment. Those who did apply may be divided into two general classes: those whose interests are wholly in engineering and who are more or less averse to the duties of a line officer; and those who had performed so much engineering duty in the past that they felt that their chances for being selected for promotion would be jeopardized if they did not stick to engineering. A few may have applied because of the permanent shore duty feature.

One of the results of the assignment of officers to engineering duty, only, was the great difficulty in getting officers to apply for engineering duty. Young officers who would have been greatly benefited by a tour of duty in the engine room began to be shy of engineering. They did not want to be identified with a branch of work which led to permanent engineering and shore duty only. Engineering in their minds became a subject separate from the subjects connected with a line officer's duties. The law prevents officers of the grade of commander and above, who have been assigned to engineering duty only, from performing duty afloat, except in certain specified capacities, and the services of these officers are lost to the forces afloat just at the time when their special knowledge and experience would be most useful. The permanent engineer is unwelcome as chief engineer of a battleship because of the restrictions on the duty he may perform, and the fact that he can not succeed to command leads to embarrassing situations. Line officers who perform engineering duty afloat have a restricted choice of shore stations, as many of the desirable berths are occupied by permanent engineers.

The accompanying diagram shows the outline of the career proposed for line officers. After about five years' experience at sea the general line course is taken, followed immediately by a specialization course. Each individual then follows his own particular specialty until, at the end of about twenty years' service, all officers take the Junior War College course. The periods of command are followed by the Senior War College course before flag rank is reached. To the time scale at the left of the diagram have been added the rank and pay periods in the proposed pay bill to indicate the approximate rank at different periods in the career. Base pay allowed in the proposed bill has been shown merely as a matter of interest.



The above scheme of education and training of line officers would give the service the specialists that are needed, doing away entirely with the old corps jealousies and lack of sympathy, and would correct many present evils. The officers of the Construction Corps and those designated for engineering, only, should be amalgamated with the line as was the old Engineer Corps. The same procedure could be made to apply to the Supply Corps and Civil Engineer Corps but it is not so important in these two

corps. With such a system in effect there would be very little chance of being skipped by the Selection Board for having performed too much duty of one kind, and such a danger does exist today. This is borne out by advice given individuals by members of former Selection Boards.

This article is not an indictment of the personnel of the Construction Corps nor of the officers who have been designated for engineering duty, only, but is intended to be a constructive criticism of a system which has many evils. The most important thing to be corrected, even before amalgamation of these two groups of officers, is the present inadequate system of education and training of line officers. Amalgamation with the line of these two groups of officers would add to the line many valuable officers in the lower grades. The officers of higher rank who elect to continue construction or engineering duties, only, should be allowed to do so, as was done when the old Engineer Corps was amalgamated with the line. When the old Engineer Corps was taken into the line, no immediate steps were taken to produce engineering specialists and, with the retirement of the old engineers, there was no one available to supervise the design and construction of engineering equipment. The need of specialists was not realized at that time as it is today. It was for this reason principally that designation of officers for engineering only was put into effect. With the system of specialization described above no such difficulty would be encountered.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TRAINING OF NAVAL AVIATORS

By Lieutenant Ralph Davison, U. S. Navy

There is no branch of the navy more interesting than naval aviation, yet there is none so little known, not only by the citizens of our country but by the officers of the service of which it is a small but important part. No one with vision can long remain skeptical of the future of aviation, nor depreciate its ever-increasing importance as an arm of the national defense. To the young and ambitious officer it offers a broad field for research and original investigation, together with the pursuit of the most fascinating profession in the world today. On the shores of Pensacola Bay, the navy has established a school for the training of naval aviators. It is the author's intention to tell something of the methods employed there in the production of pilots for the operating air squadrons ashore and afloat.

The Naval Air Station, Pensacola, Fla., is the elementary training school for naval aviators. The station is located on Pensacola Bay, about seven miles from the city of Pensacola, and covers an area of 150 acres, with a waterfront of nearly a mile and a half. The surrounding land-locked waters make the site ideal for an aviation training school, and the climate, while not perfect, affords a large percentage of flying days. The harbor is capacious, with a 28-foot channel from deep water, ample dock and fuel facilities, and anchorage for any except the deepest draft vessels. The comparative isolation of the station and the absence of the distracting influences of a large city combine in producing an environment particularly adapted to training purposes.

The course is not designed to produce expert pilots, but upon its completion the student is well grounded in the principles and practice of flight and is prepared to assimilate the advanced train-

ing which is given in the service squadrons. The syllabus of training as prescribed by the Bureau of Aeronautics was planned by officers of wide and varied aviation experience. The methods employed are those whose soundness was demonstrated in our own and foreign schools during the late unpleasantness with the Central Powers, brought up to date, and extended to take into account the highly specialized functions of naval aviation.

The student body is drawn from the commissioned personnel of the navy. Three times each year the Bureau of Navigation calls for applicants for training; candidates are required to have completed three years' sea service, to be less than thirty-one years of age, and to pass a rigid physical examination, which stresses the vision, the reflexes, and the functioning of the semi-circular canals of the inner ear. Classes of approximately fifty are selected from among the applicants, and successful candidates are ordered to Pensacola to begin their training.

Upon entry, student officers are designated student naval aviators, the designation and the performance of duty involving actual flying carrying with them an increased compensation amounting to thirty-five per cent of the base pay of the officer concerned.

It is considered essential that every pilot should be thoroughly conversant with the details of the craft which he will be called upon to operate and to this end instruction in what is known as the Ground School is comprehensive and thorough. The subjects of aviation engines and the structure and rigging of aircraft are particularly exhaustive, and the student must master the practice, as well as the theory of both. He is required to disassemble, overhaul, assemble, and adjust every type of aviation engine used in the service, to assemble and align the training type airplane, and to study the details of construction of all types of aircraft now employed. The allied subject of aviation instruments is included in the instruction.

The theoretical aspects of aviation are next considered, and the student is instructed in aviation indoctrination, in aerodynamics and the theory of flight, in theoretical aerial navigation, and in aerology. With the exception of aerial navigation, the fundamentals alone of these subjects are taught, for the aim is to acquaint the student with the broad principles upon which

aeronautics is based, and not to go into the vast details of these particular branches.

The relation of aviation to the general mission of the fleet is covered in the special subjects of scouting, maneuvers, and communications. The texts employed are those in use at the Naval War College, with additional material dealing with the particular function of aircraft in the conduct of operations in the theatre of war.

Radio is given an important place in the curriculum, for the value of aviation as an adjunct of the fleet is dependent on rapid and accurate communication. Students are taught to operate, maintain, and repair the radio telegraph and telephone sets issued for aircraft use, and in addition are required to qualify as radio operators, capable of sending and receiving twenty words a minute. On practice flights, communication is established and maintained with the station, and a high degree of proficiency in operating the radio sets is attained.

Flight training begins with the second month, and progresses from then until the end of the course. The first instruction is given in the *N-9* type float seaplane, the present standard training plane. It is a two-place tractor biplane, with a Wright 150-horsepower motor, single pontoon and dual Deperdussin controls. The *N-9*, while not an ideal training machine, has at least the advantages of a large factor of safety, great inherent stability, and a remarkable freedom from mortality as a result of crashes. The student is given ten hours' dual instruction in this type, and at the end of that period is required to "solo" unless an extension of instruction is recommended by the Advisory Board, composed of the superintendent Aviation Training Schools, the senior squadron commander, the officer-in-charge Ground School, the officer-in-charge Gunnery School, and the chief flight instructor. It is during this period that flight inaptitude on the part of the student comes to light, for inability to solo in the prescribed time is an almost infallible indication of some constitutional or mental defect in the individual which renders him unsuitable aviation material. It is somewhat unfortunate that the preliminary physical examination does not always reveal this, for much time and expense would be saved, and the candidate spared the humiliation inevitably attendant upon failure to qualify. No stigma of

disgrace should attach itself to an inability of this nature, for it becomes more and more apparent that fliers, in a measure, are born and not made.

After qualification in *N-9's,* which requires a solo period of twenty-five hours, and the successful completion of a number of tests designed to demonstrate the student's ability, he passes through the intermediate *HS* flying boat type to training in *H-16's* and *F-5-L's,* large twin-motored planes with considerable power and cruising radius. Dual instruction amounting to five hours is given in each of these types and the student is then required to solo them for a period of ten hours.

Gunnery training begins in the third month of the course, progressing with the flight instruction, and for a month consists of ground and range instruction in the machine guns employed in aerial combat, and in the theory and practice of aerial gunnery and bombing. On the machine gun range the student learns the manipulation of his gun, the clearing of jams and stoppages, and the proper use of the sights employed. Upon completion of the ground instruction, the schedule calls for a series of practices in the air, to acquaint the student with the principles of aerial combat. Bombing practice follows, first with sub-calibre, and eventually with dummy bombs (the equivalent of sub-calibre and target shell in gunnery afloat) until the student is familiar with the offensive and defensive powers of the ordnance equipment of his plane. An elementary course in spotting from the air is the final subject in the Gunnery School.

Upon qualification in the *F-5-L* type, students are sent in teams of three on long-distance navigational flights over the Gulf of Mexico, performing in rotation the duties of pilot, navigator, and radio operator. Here they are required to put into practice the knowledge they have gained in the Ground and Flight Schools, and the completion of these problems represents the conclusion of the course. The student, well-grounded in the elements of aviation, is now ready for transfer to the service squadrons, where his advanced training in special branches awaits him.

(Recent extensions of the facilities at Pensacola will permit the training of students in land-type planes, a function hitherto devolving upon the Air Service Pilot Schools, U. S. Army, or

upon service squadrons. The field will be ready by 1 June, 1922, and with planes already arriving for assembly, a great increase in the aeronautical activity of the station is expected.

A torpedo-plane school is also in existence here, with rather limited equipment, it is true, but with officers of experience directing its training, and good prospects for additional planes and equipment.)

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PERSONNEL

By Lieutenant E. R, Henning, U. S. Navy

The Disarmament Conference has halted competition between the naval powers for supremacy by number of ships. At the same time no nation can maintain a superiority on the sea by better quality of matériel or design. These things are virtually standardized.

What, then, remains to rank the first sea power? What but the men and officers who man the ships; personnel, the same old major factor, greatest always in winning battles, now by the stabilization of matériel, enhanced.

Hinted it has been that the other naval powers view with equanimity the holiday in building because they are confident the superior quality, organization, and longer training of their personnel outweigh any equality or excess of ships the American Navy may have. Is this national ego or are there grounds for this opinion?

However unfounded we may think this assumption, it should not prevent our turning a critical eye on the forces that man our ships. If there are faults, what are they? How may they be corrected?

Those whose interest in the personnel question is casual must have no appreciation of what confronts a fleet in a general action. It is a far cry from merchant ship guncrew duty or chasing submarines. Unlike land warfare in which now the whole manhood of nations comes to grips, a naval battle is a conflict of experts, a struggle between professionals. Land warfare is necessarily, on account of the huge numbers involved, fought by amateurs. The most militaristic of nations cannot make finished soldiers of all the masses war calls into action. The peace-time army is a nucleus.

How different the navy is. The combatant navy is a finished force whose training must be completed the day *before* the war. Woeful is the lot of the fleet which is under the compulsion of wide expansion and re-arrangement of personnel after the declaration of war.

The armed land forces may sustain one crushing defeat after another, but with a large spirited population to draw on, backed by tremendous resources and wealth, victory on land can still be wrung from the enemy. On the sea in a general engagement, the usual penalty of defeat is all major ships sunk or put out of action. A navy, beaten in a great battle which it may be forced to fight two weeks after the opening of hostilities, is finished. In a republic a philosopher expects the first two years of the war on land to be a series of reverses, with military efficiency a rising curve reaching a maximum hardly before the third year of the war. New armies may be made in eighteen months or two years, while a navy can't be built on the wreck of a defeated one in ten years. When rival fleets meet in decisive action, each has one great chance and only one. There are no great lines of entrenchments and fortifications prepared for the vanquished to take refuge behind for months, while girding up the loins for another try.

The greatest navy numbers comparatively only a few men in its fleet. It is possible to develop this small force to a high degree of skill, discipline, and spirit. When the enemy is a few thousand yards from the opening range, the men at the gun stations, in the fire and engine rooms, cannot be under training. They must be trained.

PERMANENCY OF PERSONNEL

Manifestly, the first requisite for efficiency is permanency of personnel. Sailors are not made by a brief sojourn at sea, nor are ships' companies co-ordinated into smooth running organizations by constant discharges and transfers. Personnel turnover and efficiency vary inversely. Ships of the first line must be in a state of constant readiness for war. Therefore they cannot permit but a minimum change of ship's company at one time. That is evident.

The statistics given in the following quotation from a recent issue of a service journal are highly significant:

Figures for officers of all corps and men of all classes and marines in the three navies are as follows: United States, 130,809; Great Britain, 142,088 (including colonial navy); Japan, 82,150.

Of perhaps greater importance in the comparisons than the table of figures is a study of the different conditions. For example, the British enlisted strength is composed of men serving in twelve-year enlistments, whereas our own enlistment periods are for two, three, and four years, resulting in a heavy turnover which amounted last year to 68 per cent. Of our force, 82,849 were youngsters in their first enlistment, and 16,552 more men had had less than four years' previous service. The British Navy last year included 68,361 men serving in the first period of continuous service, viz., for twelve years; 21,000 men were in their second period of continuous service (ten years to complete time for pension), and 8,501 were in four so-called "short service" (five years plus seven in the reserve). As for the Japanese Navy, it is known that the proportion of trained, efficient men is much greater because of the nature of her population. An American captain recently detached from a battleship stated that his former command averaged less than nineteen years of age and consisted in large part of men serving in their first enlistments. In the absence of any continuing policy with regard to either complements or periods of enlistments in this country, it is inevitable that a large percentage of the enlisted strength is composed of recruits at shore training stations or green men learning the rudiments of their work on board ship. The past two or three years have been a period of constant turnover of enlisted personnel, with a recruiting drive followed by a wholesale discharge of men, closely followed by another drive, only to result in a heavy reduction due to a diminished appropriation.

Can such a situation in the American Navy be long tolerated and a high standard of relative efficiency maintained? It is an acute situation and its remedy requires radical measures.

The first step is a radical one. *Make the first enlistment six years.* It is not necessary for me to hold forth the advantage of this. Every officer knows the adoption of the long enlistment period would result in the nation getting a return for the early years when the recruit is receiving and not giving. Other powers have six- and eight-year service periods. Isn't it somewhat fatuous to believe that we can do as much with our recruits in four years?

The great objection to the long enlistment period has been one of expediency; sufficient men could not be gotten for such long service. What better time is there to try it than now, when the navy is not pressed for men? A trial would demonstrate that the six-year enlistment plan could maintain, with ease, a navy

of 87,000 men. That would mean in round numbers replacements by enlistments and re-enlistments of 18,000 men a year. It is reasonable to believe that among men who had served six years a high re-enlistment rate could be maintained, probably as high as 8,000 a year. The recruiting agencies would have to enlist 10,000 men a year, not a difficult figure. Better men they would be too; not the kind who enter the navy for a convenience, but the sort to make the sea a life's work. I refrain from going into detail on the incalculable saving in money and matériel in the resultant great reduction of number of men necessarily under training, by the adoption of the six-year period of enlistment.

That, however, is not the only thing to stabilize personnel.

Too many men, yes, too many officers are birds of passage. An unvaried rule to make the length of service of men and officers on ships and stations a period of three years, and not to authorize transfers except for reasons of the gravest nature, would show some startling results in the efficiency of most ships. Matters of slight personal convenience should not be considered as warranting a transfer. In fact, with the rule rigidly enforced, it is highly probable that the desire for transfers would not develop as frequently. The enlisted man has almost gotten to the point where he considers it his prerogative to request transfer, following disciplinary action or firm language from one of the petty officers.

It would improve the mental attitude of all hands. The fact that a ship could not be dodged by a transfer, that it was a man's for several years, would be an inspiration for energy. Who has not more than once observed the chief petty officer who worked no harder on his station than inspection enforced, because, "I'm going to the West Coast soon." To take a specific case, has any one failed to observe what happens to a pair of submarine engines when there are three or four chief machinist's mates attached to the boat inside of a year? There is always the other fellow on whom to blame unspeakable valves, or pumps which won't work. The chief petty officer who has the same duty for two or three years can't attribute neglected engines to the man before him. He knows it too. It shows in his work. The engines are his.

Frequent transfers foster a restless spirit in the personnel. The Department has recently recognized this tendency of the

enlisted men to "float." Recent instructions direct that all stragglers are to be returned to their commands, recognizing the prevalence among men of the resort to report some place else after their ship has sailed to avoid disagreeable duty.

Of no small importance, the strict enforcement of the rule to prevent transfers, would check another growing evil. Time after time nearly every executive officer has the experience of receiving men whom a few days of observation show to be undesirables, usually petty officers rated during, or immediately after the war, by that fine frenzy that possessed some officers for rating every one without regard to his qualifications. These men come to ships with long record of ships served on, with transfers every two or three months. No one has the moral courage to break them. It is easier to pass them along to some one else. I need not enlarge on the unfortunate effects of this unfair practice.

To correct this situation the following measures are advocated:

(1) Allow no transfers *to* ships of the first line of men having less than three years to serve.

(2) Permit no transfers *from* ships of the first line until after three years' service on that vessel except under exceptional circumstances which must be referred to the Department.

(3) See that men unavoidably transferred from ships of the first line to hospitals, etc., are on return to duty ordered back to their command.

(4) Until the observance of the above rules thoroughly stabilizes the personnel, the men at receiving centers ready for transfers who have periods less than three years to serve, detail to auxiliary vessels and non-combatant craft on which the organization is not as complex and the duty does not require such co-ordinated training as in the fighting ships.

(5) The Bureau of Navigation can very readily institute the three-year rule for officers.

The personnel, kept in a state of flux, time in the navy which should be spent in advanced training and co-ordination, must be diverted to organization and elementary training of recruits.

TRAINING STATION EXPERIENCE

In any discussion of the improvement of the personnel of the navy, attention cannot be spared to the importance of every recruit, regardless of what branch of the service he is entering, completing the full term at the training station. Here the unfit may be weeded out, the deficiencies that got by the recruiting officer found out. The man who has gone through the training station has all the earmarks so apparent when he is compared with any of the unfortunately large number of men in the service who have had no training station experience.

The training station period for every man should be six months including a three months' training ship cruise. Incidentally, under the adoption of the six-year enlistment plan, the recruit could more readily be spared for a six months' training period.

In considering the training station, the importance cannot be too strongly urged of sending exemplary chief petty officers to this duty as instructors, men of outstanding character and personality, men who are experts in the specialty they teach. Nothing makes such a farce as a chief petty officer with a meager knowledge of the drill book attempting to drill a group of youngsters many of whom have had military experience.

Nor should the disciplinary officers at the training stations be men who have reached that stage of their careers where complacency is more evident than energy. The recruit is highly impressionable.

Start him off neat, orderly, smart in uniform, thorough and obedient, and ten chances to one he will remain so throughout his cruise. Let him find out that drill may be slovenly done, orders neglected, and a dirty appearance tolerated, and it will be unlikely that he will ever be broken of his habits aboard ship.

If a martinet has any justification anywhere it is at the training station. It is easier to slack down than tauten up.

MILITARY STANDARD

Military standard is the foundation of an armed force. It is the influence that co-ordinates, that binds the whole. High military standard fosters thoroughness and attention to detail, parents to efficiency. It opposes slovenliness, whether that slovenliness is in standing a quartermaster's watch or repairing a pump.

The military standard of the personnel of the American Navy has been lowering through a period of years, particularly those of the Great War. During the rapid expansion of the navy, thousands of men were inducted into the service and sent to sea without training station experience. Following the war, during the harrowing days of demobilization, the two-year recruits were enlisted directly aboard ship. Not only many of these men, but officers too, with little or no military training, still remain. Their lack of training, and often even sympathy or understanding for its need have lowered the general standard. Military standard like labor saving machinery is opposed by those who have no experience with it.

Not altogether to the latter may the fault be laid. For years previous to the war the officer was a type, who if not avowing open hostility to the maintenance of military standards, never showed the slightest energy in instilling it in his men. The type is still prevalent. "What, a blue jacket is not a marine, you can't make him military, it is not in him!" They say it as if the blue jacket was recruited from some different timber than the marine, as if he were of some different race. Listening to them, the uninitiated would gather that the smartness, the exactitude with which he obeys orders, the *esprit de corps* of the marine, if found in a blue jacket, was to be deplored.

Man has been fighting since he fared forth from the Garden of Eden, and if he has learned one thing surely, it is that masses of men numbering more than ten for the highest combat efficiency, can be controlled under no other than the military system. Even our friends the Bolsheviki have learned this lesson.

Then, if the military system is necessary, is there any excuse for observing its requirements in a lackadaisical or slovenly fashion? If there is, there are several pre-eminent naval powers who are expending energy in useless efforts.

Does it breed good habits for the division officer to call his division to attention and have half his men remain with their hands folded behind their backs, some talking, others with heads turned around looking at passing shipping? Yet this is the rule rather than the exceptions on many ships. Does the seaman who remains sitting on a ditty box as the first lieutenant speaks to him exemplify the proper respect for superiors and the re-

sultant respect for their orders? The same man would jump to attention if the chief petty officer of his company at the training station spoke to him. Why is it the fashion for him to forget these things in the fleet? Is the youngster who is permitted to argue an order with the boatswain's mate breeding good battle habits? Is the blue jacket sentry who remains sublimely indifferent in his seat, as an officer passes, something to boast of? The regulations are specific. Are they made to be ignored? Do such men promise to make good submarine lookouts? Slouchy sentries stand their gun station in war slouchily. They all are being indoctrinated with the habit of indifference toward orders.

To the superficial thinker these things are inconsequential details. He doesn't see that habits of mind are being inculcated which will bear fruit in graver moments.

How often is the plaint heard that the chief petty officer is less and less realizing the twofold nature of his duties, the military as well as the professional? Why the great difference between the first sergeant of marines and the average chief petty officer in the reliance that may be placed on them for the maintenance of discipline? Why is it true that so many chief petty officers regard themselves simply as mechanical experts in uniform, with responsibilities which end with the upkeep of machinery detailed to them? Not only the chief petty officers but the men, particularly in the artificers' branches, view with surprise the imposition of military responsibilities. Really isn't this to be expected when you take a boy from civilian life, give him little or no training station experience, and then put him in the fire room aboard ship, where he does nothing but stand his watch?

The remedy? Concretely, the same thing they do at the military schools, for the purpose, they say, of building character; they call it the disciplinary period at the Naval Academy—infantry drill. Not infantry drill for the deck force alone, but for all hands, engineers, electricians, yeomen, mess cooks, all; drill to inculcate proper battle habits. The yeoman in the plotting room, the ship's cook in the ammunition party are just as important cogs in the machine as the seaman in the gun crew.

I will refrain from dwelling on the advantage of having a capable landing party aboard each ship. Time and time again the

occasion arises when the blue jacket is compelled to play the soldier ashore, and lack of knowledge of infantry fundamentals is embarrassing if not tragic.

To inculcate the habit of instant obedience, alertness, and attention to orders, nothing can be substituted for infantry drill. To make the petty officer used to the sound of his own voice, to get him in the habit of expecting instant obedience, there is nothing like it. It is truly, discipline drill.

True it is that infantry drill is carried out by the deck force, aboard the battleships. Aboard the gunboats and cruisers landing parties are occasionally made. This personnel is still a minority of the total in the navy. What drill is observed aboard the great number of ships on detached duty, auxiliaries, shore bases?

When infantry drill is held, how perfunctorily it is carried out. Many of the petty officers know next to nothing about drill regulations. If the drill regulations are to be taken as a standard, many drills are nothing short of a comedy of errors. Instead of the drill effecting the end aimed at, smartness, alertness, thoroughness, promptness; the reverse results. Better no drill at all than a slovenly one.

Much depends on the officers. It does not take long for a crew to realize that reports are to be made in a military fashion, that neglect or indifferent obedience to orders will not be tolerated. It does not take a crew long to realize when the officers do not regard it their personal option whether or not to enforce regulations on salutes. Strictness has never made an unhappy ship's company. The men know where they stand. Respect demanded engenders respect.

The officer who nurses the covert ambition to be considered the "good fellow" is one of the fundamental causes of low standards. He fosters the slack ship. Though often he gains in the end his just deserts, contempt where he seeks esteem, he is one of the greatest agents of the lowered standard.

It will require plenty of backbone to bring the military standards in the seagoing navy back to a high level. Long tolerated abuses have become vested rights.

In fine, if the American Navy is a military organization, as the reading of the regulations, rules and instructions for its government indicate the intention is, then let us run it as such.

PHYSICAL TRAINING

Time was when the seafaring life developed the greatest physical hardihood. Laying aloft, furling and unfurling sail, small boat work, all bore a part in making the sailorman the sturdiest of men. After the passing of the sailing ship with its activities, frequent coaling ship helped to keep the blue jacket fit.

Change has come. The oil burning navy, with the electric motor everywhere doing the work that sinew and brawn used to do, has taken the place of the old navy with its muscle building work. The fireman in the oil burning fire room has a life of no more physical activity than the captain's yeoman.

What has been done to take the place of the active life of the old ship? What has been substituted to build up the physical fitness necessary for the stamina which battle requires?

The Swedish drill? Yes, on the battleships the Swedish drill exercise is routine for fifteen minutes or half hour a day. Some of the lesser ships, too, have physical drill. More have no drill at all. In the shore based navy, physical drill as well as every other kind of drill is noticeable by its absence.

It will be urged here that athletics, so widely engaged in throughout the navy, give the blue jacket plenty of physical exercise. That is one of the great illusions. There is of course a small minority of men in every command who are in for every sort of athletics. They keep themselves in excellent condition. The vast majority of the men in the navy are merely spectators, not participants in athletics. Then there is a considerable minority who, when work is knocked off for athletics, utilize the time for extra sleep. What about their physical development?

Organized physical training is the only way to maintain high physical development. Swedish movements are good, but they alone are not sufficient. They have as much calisthenics at most modern girls' schools. More exercise is needed to develop a navy of men, all of whom are fit.

I realize the value of athletics in the fleet. There are those who bitterly condemn athletics, who point out to you that frequently necessary drills and ship's work are passed up on account of ball games. This attitude is unreasonable, though an occasional commanding officer, suffering from the athletics "complex," can work incalculable harm. Transfers of men are

engineered solely for their athletic ability. Everything is subordinated to obtaining a champion team. Under such a régime the same condition is fostered as that which forced some of our leading colleges this year to institute vigorous reforms in their athletic standards.

A high average of physical fitness for the entire crew is more to be desired than a half dozen champion teams. Better than a champion cutter crew of the fleet, is a ship's company, each and every one of whom could stand a mile's hard row without collapsing. The ship boasts empty honors that has three boxing champions and the rest of the crew slack bellied. By no means discounting the glory of having the fleet champions in football, yet rather would I have a crew that could hike ten miles, and do the last mile on the double, all the crew sound physically, not an exalted tenth.

Athletics do have their functions. They serve as a stimulus to perseverance for physical fitness, they foster the ideal. But neither Swedish drill nor athletics suffice.

More time and interest should be given to the physical development of all hands. I have never yet seen a ship or station that could not afford a period of one hour a day for personnel development, a period for military discipline and physical drill for *all* hands, officers and men—infantry drill, exercise in small boats, boxing, wrestling and a weekly hike when in port for every officer and man in the complement. One hour a day, five periods a week, can't the navy spare that much for the development of its men?

Far be it from me to discount the opposition such schedule would encounter throughout the navy. On the first day of an infantry drill or boats under oars for the engineers, or boxing or wrestling for the electricians, the chief engineer would rush up to the executive officer with an appalling work list. The electrical officer would have half the armatures aboard ship to rewind. The first lieutenant would be under the compelling necessity of breaking out all the store rooms and the hold, and restowing them before four o'clock. The paymaster would be struck dumb if told that for the well-being of him and the yeomen of his force they would join the party going on an hour's hike. He would suddenly discover a legion of returns that had to be made instantly. Petty officers who might be found sitting on

the shady side of a turret engaged in a profound and placid contemplation of the universe would suddenly find a half dozen jobs on which the safety of the ship depended, when directed to get ready for infantry drill. From one and all as many unanswerable reasons would be given as those of a captain's yeoman why he should not be subject to the indignity of Swedish drill.

In most shore based establishments, there would be imminent danger of a head of a department bursting a blood vessel if told that from three to four that afternoon the enlisted personnel of his department would have to get out for drill. There, too, where the need is often the greatest. Drills and inspections at a minimum or none at all, the shore-going is often not even creditable in appearance. Neatness and smartness of uniform, is the exception and not the rule. Nor are the enlisted men alone, it is regrettable to say, in bearing out the above.

Nothing save an imperative order from the Department, so specifically worded that obedience is unavoidable will compel the universal devotion throughout the navy of one hour a day to personnel development. As its results are appreciated, obedience will be more willing.

MORALE

Morale development, to most naval officers, depends on moving pictures, smokers and athletics. They are partly right. Entertainment unquestionably is necessary for a happy frame of mind. Yet high morale is more than content. High morale in a military sense is that state of mind which wins battles. Work for the high morale means work to induce a spirit in the personnel for successful battle thinking.

What do we do in this regard? Our recruits are as a rule young men of considerable spirit, and aboard ship an excellent general spirit usually prevails. An honest and keen observer would say, however, if there is any fault to be found with the mental attitude of the American blue jacket, it is the lack of *esprit de corps,* the lack, at least on the surface, of pride in the service. Now pride, no matter what it may be considered elsewhere is not only desirable but necessary in a fighting man. Pride will keep a man facing a danger, on which with brute courage alone, he would turn his back. Pride forced a French marshal to gallantly charge the enemy on repeated occasions

when he admitted his quaking knees would have carried him to the rear.

Much of this pride in the fighting man is developed by example, what those before him have done. Drake's repeated victories over the vastly outnumbering Spanish forces laid the belief that one Englishman on the sea was worth five Spaniards. This belief helped to defeat the Spanish Armada. The Spaniards doubtful, the English superbly confident, settled the issue. Tradition is the invisible host that spurs the victor and weakens the vanquished.

Now, there is no navy with more splendid traditions than our own; defeat rare and never dishonorable, no task too hazardous to find ten times the men needed for its attempt. Yet of the splendid stories of the navy, is there one blue jacket in twenty who has the slightest knowledge of them? How many men know the history of the *Constitution,* or are familiar with the story of the cutting out of the *Philadelphia?* Many do not even know what the *Oregon* is celebrated for, or what Hobson's attempt was in the harbor of Santiago. Has any effort been made to familiarize the personnel with these tales, heritages of victory? With one exception, I have never seen any. Several years ago a circular letter was set forth suggesting that information on the history of the navy be published to the personnel. In most cases that letter went to the files or the waste basket, one of those trifles not worth bothering about.

Yet every student of psychology knows that habit, or custom, is one of the great controlling forces of human life. Those races to whom it has been customary to win battles or to fight to the death, never to recognize defeat, do so because it is their tradition to do so. Those whose history furnishes no tales of stirring victory, but frequent examples of flight from half fought fields, of pusillanimous surrender, will fight half-heartedly again. They have the precedent of it having been done before to justify them.

The American general in the recent war, receiving the order to give up his position, who protested to his French superior, "Americans do not retreat" was of the mind that wins battles.

Is it a trifle, then, that if the test of battle ever comes, in the tense moments as the great turrets swing slowly over the cleared decks toward the enemy line in the far horizon that the

men at the guns, that the men below decks know that Americans have never failed their country on the sea? Is it a small thing that their brains may conjure up pictures of Perry on the Great Lakes; or Farragut at Mobile? Will they not be strengthened by the knowledge that though the fleet actions of our navy have been few, in every case all ships of the enemy were sunk or captured? This is not sentiment; it is psychology. Lack of tradition was probably the final reason why a certain great navy ingloriously sailed forth to give themselves up to the enemy without firing a shot. We, with a wealth of glorious traditions, shall we neglect them?

How is it to be accomplished, this inculcation, indoctrination of the personnel with the ideal frame of mind, the victory frame of mind?

It can be readily done and with little effort by the propaganda method. In the living quarters of the men, on the bulkheads beside the broadside guns, post framed illustrations of the stirring stories of the navy with a history of the event in inspiring language. Once a week use a few minutes of film in the moving pictures for a story of the navy, with illustrations if possible. Interesting statistics showing the number of vessels sunk or captured by the *Constitution,* the successful sloop actions in the war of 1812, the fact that a vessel of the navy has never been in the hands of mutineers, these all, could be made a matter of knowledge throughout the navy by that tremendous medium, the moving pictures. If the navy could obtain or have produced a series of romances based on historical events on the sea and use them in the moving picture entertainments, knowledge of the naval traditions could be further spread through the service.

All this effort must be made to groom the navy to a standard to assure victory in battle. The personnel of the other great naval powers are drawn from a seafaring population; they are animated by a spirit and tradition of victory. From this splendid material, excellent seamen are made by long periods of service afloat.

We take the boy out of the New England factory or store, or off the middle western farm and put him in uniform. Can we afford to train him less thoroughly? In training it is the details that count.

THE RESERVE

No discussion of the personnel problem is complete without consideration of the reserve. It is telling no secret to declare that the reserve up to the present has not been in a satisfactory condition.

A reserve to be of any value must have two qualities—training and the ability to mobilize at short notice. The reserve, thanks to the past war, has the necessary seafaring experience. But can it be mobilized rapidly? Or does the actual detailing of the reserve commence after war has been declared? If so, the organization is dangerously defective.

Will the situation arise when the navy again faces war, that the reserve report in at certain large mobilization centers and there be hastily detailed by young reserve officers to the various ships which are madly calling for drafts of men. In the hurly-burly of confusion, the submarine trained men will go to the cargo boat, the water tender to the submarine, the chief torpedo-man to a gunboat. That invariably happens when an organization is such that a tremendous amount of paper work must be done on the advent of an emergency; when a small organization must suddenly be greatly enlarged to handle large numbers of men, when untrained yeomen must be taken into service to do a large press of paper work.

I am reminded of a condition that existed at a certain large receiving center during the war. Thousands of men were gathered there without the facilities to handle them. Two old excursion boats were taken over to quarter the men. Drafts were coming in and going out. No regular officers were available for duty in charge.

What confusion existed cannot readily be imagined. A certain phase of it would be illuminating. A ship fitted out, ready for sea, would call for a hundred and fifty men immediately. A personnel yeoman would type out a list of 150 men attached to the station and send it over to the aforementioned excursion steamers. An officer on duty there would give the list to a petty officer who would go through the decks calling out the names of the draft. After the elapse of some time, possibly ninety men would be gotten together. Then word would be sent over to the receiving ship offices that sixty men could not be found.

Thereupon the personnel yeoman would make out a list of sixty new men. Possibly forty of these men would be found. Then a new list of twenty would be sent over. Finally the draft would be assembled.

During the next two or three days the absentees would be assembled at the mast. The uniform excuse would be that time-honored one, "I was in the head, sir," or that they were out with a working party. It was said that some individuals avoided going to sea for many months by the above method.

In time, after months elapsed this condition was remedied. Proper quarters were provided. A regular officer of organizing ability took command.

In the next emergency will time be vouchsafed to do our organizing after war is on us?

It is a temptation to include many other stories of the handling of personnel in the early stages of the war; of elegant young gentlemen whose fond parents for the consideration of a lieutenant's commission bought small yachts for them to engage in the hazardous pursuit of the enemy submarines on the Atlantic littoral; of the other gentlemen less elegant, whose enlistment while saving them from the possibility of the trenches was followed by duty strangely of such a character that they were able to carry on their New York businesses; of commissions and ratings gained in certain devious ways. These are war-time classics now, something to smile about over ward room tables, but would these stories have been so droll had the enemy been loose on the high seas?

After months and months the personnel situation was well in hand. Organization was effected. If the occasion again arises can we be sure equal time will be granted us to transpose an organization made for peace-time routine to one fit to cope with war emergencies?

The situation described is likely to happen when men have to be gotten together in a hurry. Why not avoid this if the time comes again? The war-time organization can be effected now. Contingencies can be prepared against. Von Moltke is still right.

The first consideration is where the reserve is to be used. It cannot be too strongly urged against filling up the complements of the battleships of the first line with reservists. Notwithstand-

ing what objection may be raised, the dreadnoughts of the fleet should be kept manned at the strength they would go into battle. Putting a large draft aboard a battleship tends to confusion, no matter how well trained the individuals of the draft are. Their absorption, assimilation in the organization of the ship, is the matter of weeks or months. They throw the whole "team" out of gear. The plan for the reserve should contemplate filling out the ships operating under reduced complement, auxiliaries and other vessels whose crews are not as highly organized as those of the battleships.

Most officers attached to the fleet will not forget our entry into the last war when many of the trained gun crews were transferred to armed guard work on the merchant ships and recruits in the hundreds were thrown aboard the ships of the fleet. Suppose the fleet two weeks after the declaration of war had had to steam forth to a major engagement?

Speed of mobilization, getting the reservist where he is needed immediately, is the paramount requisite of an effective reserve. To achieve this, some different system must be developed. How can it be done? In this wise.

Each ship will be accountable for its own reserve, the enrollment retainer pay, transfer, discharge and mobilization. The destroyer *Dent,* we will assume, based at Philadelphia with reduced complement, half or less what she will need in war-time. She will recruit her reserve among former navy men, preferably destroyer men, men that have been discharged. John Jones, quartermaster second class, is discharged. He does not intend to re-enlist. He is going to his home in Wilmington. Good. Will Jones enlist in the reserve on the *Dent?* Nine times out of ten he will. The yeoman gets all necessary information from Jones. Jones is instructed that on the outbreak of war, when mobilization is declared, he will immediately take train and report to the *Dent.* He is given an identification card, setting forth that he is a naval reservist and directing any railroad to honor that card for passage on the mobilization of the navy. Smith, water tender, who was discharged three months ago from the *Dent* is sent a letter asking him to join the naval reserve for service in time of war.

In this manner a reserve crew is built up for the *Dent,* carried on the rolls of the *Dent.* War declared, that destroyer has a

full crew in two days, a crew that has been trained on that vessel, a crew who know each other. No time wasted in training a draft most of whom would be without experience on a destroyer. After the declaration of war, the overcrowded receiving centers haven't time to pick the men properly qualified for the duty they are detailed to.

Two hours' work a day would be sufficient for one yeoman on each ship to keep up the paper work necessary for such an organization. One week a year service would be ample for the trained reservist. Active duty should be at the same time for all reserves, a check on the mobilization system as well as on the individuals. The pay for *the entire year* would be given the reservist on the expiration of the week's cruise. Absence would result in the forfeiture of pay.

The same system can be applied to cruisers, gunboats, submarines and auxiliaries.

With mobilization declared the newspapers throughout the country publish the points where reservists report to join their ships. This will give no information which the enemy will not know. Trust their intelligence service for that. It is a waste of effort to conceal something which is no secret.

Isn't the advantage of this apparent? *Mobilize navy* announce all newspapers. Immediately all reservists start for their ships. In three days every reserve ship has its full crew, full crew of men who have served on that particular ship in most cases.

Officers and men whom it is contemplated to use on shore stations can be detailed *now.* They too will immediately report on the mobilization of the navy.

In the merchant service there are certain vessels which the Department can decide now would be necessary to divert to the navy on the declaration of war. It would be entirely feasible to arrange with the private owners to man the ship with naval reserve officers and men so that on the opening of hostilities, the vessel could automatically shift to the navy. In fact the proposed ship subsidy can be made contingent on manning ships benefited, with reserve personnel.

Contrast the above method of handling the reserve with the complex organization heretofore attempted, the naval district idea. Thousands of reservists cannot be handled from office

buildings. In the first place it requires expenditure of much money for office work which just now Congress has not made available. In the second place it does not maintain personal contact between a ship and the reservist. Any system for the reserve which involves a tremendous amount of paper work to keep going, and more after the declaration of war is fundamentally defective.

The proposed system has the virtue of utmost simplicity. It removes the handling of the reserve from offices to shipboard. It gives the reservist a definite status. He has *his* ship. He knows where he goes at the outbreak of war. In place of uncertainty, it gives certainty.

Each ship on reduced commission, reserve or ordinary, has its fifty, a hundred, or possibly three hundred reservists to carry along, the status of whom is no more different from that of men on furlough, indefinite furlough. Each ship has its few reserve officers, their fitness and training well able to note. Compare this to the lamentable system of trying to maintain contact with 50,000 men and thousands of officers by the district headquarters method.

Does it require much vision to see how the two systems would function on the advent of war?

The new system has the advantage of little cost. It is carried on by the regular navy. It requires no appropriation except for reservists' retainer pay. It could probably be made to work with a voluntary reserve without pay.

It is easily started. Every ship in the navy can start it. They can recruit their own reserve from:

(a) Men they discharge.
(b) Men of the old reserve who have training on the type of ship.

Through the publicity agencies and other means of communicating with former reservists, the Department can recommend their enlistment on a ship, a type of which they have had training on. The original impetus given, the Department could wipe its hands of further bother about the reserve.

Reserve officers in starting the system off would have to be assigned to the various ships, care being taken to assign officers to the type of ship on which they served during the war.

The Department with due regard to the homeyards of ships can submit to each naval district a list of ships and stations to which the naval district will detail the reserve officer personnel carried on their rolls. This done, the naval districts will cease handling reserve officer personnel.

What confusion such a system would avoid, what a saving of precious time, what a saving of hundreds of yeomen and badly needed officers at the mobilization centers on the declaration of war.

At the present writing, we are confronted with the problem of a reduction of the personnel, both men and officers, possibly forty per cent of the total strength. This personnel is available for reserve organization as outlined.

Who is it that said the mark of efficiency of an armed force is the smoothness with which it passes from a state of peace to a state of war?

Training of Officers

It is perhaps a highly critical eye that can find fault with the system of training and educating the American naval officer. However, if there is one fault, it is that there is nothing, if he lacks the urge in himself, to keep him a student after he has left Annapolis. Unfortunately possibly, the naval officer has never completely learned his profession from the day he enters the Naval Academy to the time he may command a battle fleet. Study is his lot whether he delights in it or not, else failure may face him in a moment not only important to himself, but to his country.

Some thought lately has been given to a "postgraduate" school of the line. Is it necessary to establish such a place ashore?

Why shouldn't on all ships and stations, except the very smallest ones, two or three hours be set aside as routine every week for lectures on strategy, and tactics, naval history, seamanship? Officers could be required to do a certain amount of study on these subjects.

It is true, I know, that something like this plan has been tried under one or two commands but there has never been any general attempt to follow the idea.

Is it well that officers should receive no training in the art of war until they approach the end of their careers?

A steady routine of one hour, two or three afternoons a week on all ships, would not take long to inculcate the proper indoctrination in the first principles of the art of war.

The war college correspondence course will be pointed out, but what per cent of officers complete this course successfully?

What is the test of the naval officer? What means have the heads in Washington to know what the mental ability of the lower ranking officer is? Nothing usually outside of his fitness reports and examinations for promotion.

Of what do these examinations consist? Almost entirely up to the highest ranks, of nothing but questions on subjects studied at the Academy. It is a test of what the officer remembers of the Naval Academy education. Actually it is a test of what he can cram from Naval Academy textbooks and "gouges" in a few weeks' time before the examination. Careful consideration would show that in some respects, a change in the examination method is warranted.

Why shouldn't questions be introduced in the all important subjects of naval history, our own and foreign, and the lessons to be deduced from them; questions on foreign navies such as would be of value. No officer is too young to be thoroughly conversant with the history of naval warfare. Nor is any officer too young to be a student at least of the art of war and the principles of strategy and tactics.

The examinations for promotion are the only available instruments to compel an interest in their profession on the part of the indifferent. Now, lacking a good memory it simply compels a few weeks of cramming.

This is not sound.

CONCLUSION

The foregoing is not held forth as something new. In fact, it aims at the principles followed by all successful armed forces in the past.

Appreciation is not lacking of the splendid qualities of the personnel of the American Navy. From the standpoint of mechanical ability they are not excelled and probably not equaled. Of courage unquestionable, quick-thinking and resourceful, splendid stuff they are. With faults of organization eradicated and necessary training instituted, its observance rigidly enforced, a

navy of incomparable men-of-wars men will result. With the attitude that no detail in the development of personnel is too small to disregard, the men and officers of the navy will be truly a *corps de lite*. That is what they should be, and what they must be. Otherwise we are gambling with fate.

We are faced at this time with a great reduction of personnel. The reaction that has always followed a war in this country has set in. A comparative small force of us may be left. So much the greater our responsibility to keep the "sacred fires" burning.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

REWINDING A MAIN DRIVE MOTOR ON A DREADNOUGHT

By Lieutenant T. A. Solberg, U. S. Navy

In the building of electrically propelled warships it was believed that no occasion would ever arise requiring the entire rewinding of either the main generators or main motors. In the event of such a possibility, however remote, it was generally conceded that the unit affected must be removed from the ship and the work done either by the original manufacturer or a navy yard.

The remote possibility was, however, realized when number four main motor on the U. S. S. *Tennessee* was damaged on March 12, 1921, by a fire resulting from a double ground on two phases or a short circuit between phases. The damage was such as to require complete rewinding of both rotor and stator, as well as the renewal of a small portion of the stator iron laminations, which had been fused in the slots by the intense heat. After conference between the ship's officers and the Westinghouse representative on board at the time, the commanding officer requested authority for the repairs to be made on board. After conference between the Chief of Bureau of Engineering and Westinghouse representatives this request was finally approved and the work authorized on March 22, 1921. The accomplishment of the repairs in the short period of seven weeks more than justified this procedure, for any other plan would have required fully twice as much time. The work was done under the direct supervision of the contractor's service engineer, Mr. J. J. Brown, who had been in charge of the installation of the main propelling machinery on the ship. The direct labor was performed by eight winders and an iron worker, assisted by picked men from the engineer force of the ship. Four of the winders and the iron worker arrived on board on March 24, and the other four winders arrived

March 25. The work was carried on twenty-four hours a day and seven days a week. In view of the rising importance of electric drive and the interest being taken by the service in general in this type of propulsion, the more important details of the repairs made on the motor are described below.

The accident necessitating the rewinding occurred while the ship was off Guantanamo Bay making rehearsal runs for her official trials, which were to be held upon completion of the shaking down cruise.

The vessel got under way at 6:00 A. M., Saturday, March 12, and proceeded on measured mile to complete standardization runs. First run was made at 116 R.P.M., 24-pole combination, on the two outboard propellers, with the two inboard motors disconnected. The second run was to be made under the same condition except that it was to be made on the 36-pole combination. The first run had been completed and the turn made at the end of the course. The ship had been settled down following the turn for about four or five minutes and had been steaming on the 36-pole combination for about twenty minutes when at about 7:05 A. M., a loud report was heard, which, upon investigation, proved to be a short circuit with resultant fire on number four main motor. The burning insulation produced such a dense and stifling smoke that it was difficult to get near the motor even with gas masks. No provision had been made for the use of steam or fresh water connections for extinguishing a fire in the motor on account of the remote possibility of a casualty of this nature. However, later designs make provision for this casualty. The fire was confined to the air gap and although it was realized that the use of Pyrene or foam fire extinguishers or salt water was injurious to the insulation all were tried as being the only means readily available. Their effective use was prevented due to the design of the motor providing a deflecting air shield which completely covered the air gap.

As soon as this was apparent the engineer officer decided to flood the motor room. The water had already reached the level of the floor plates. At this time someone suggested going full speed with the two inboard motors, thus turning number four motor rotor by the drag of the propeller and allowing the burning rotor to be rotated through the water. The bottom of the

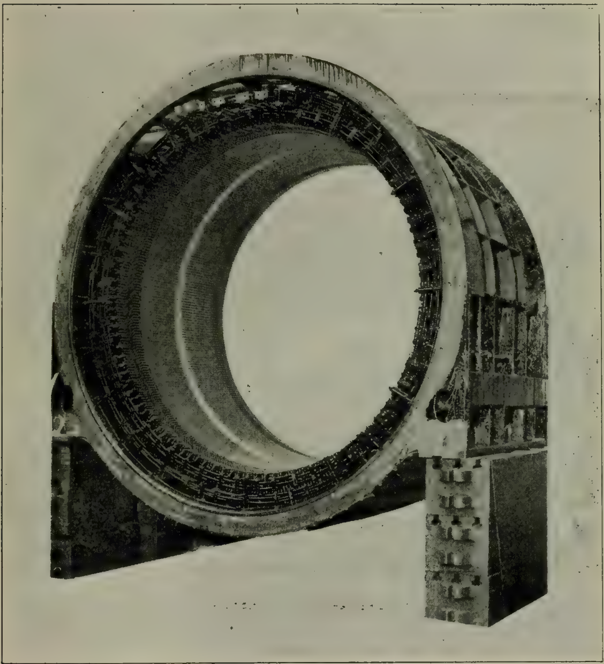


Figure 1—Motor Stator

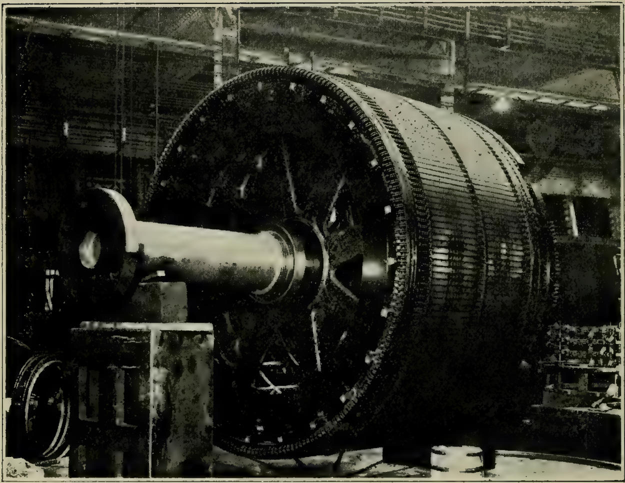


FIGURE 2—ROTOR ASSEMBLED

rotor was already immersed in the water. This was done and proved effective immediately.

There remained nothing to do but disassemble the motor to determine if possible the cause of the accident and also the extent of the damage. This inspection at once made it apparent that most of the windings must be removed and that a portion of the stator iron which had become fused must also be replaced. High potential tests later on showed that all of the windings must be renewed. Although many of the coils had not been damaged by fire, the salt water used on the fire caused them to break down on the high potential tests.

Upon disassembling an examination disclosed the following damages to the motor:

Note: There are 360 slots in the stator which are numbered clockwise as viewed from the collector end, beginning with No. 1 at the top and to the right of the vertical center line.

(a) *Minor mechanical injuries in ventilating duct of stator.*

Metal sheath around coil badly torn in slots 168, 173, and 181. Metal sheath and insulation around coil torn, but in no case very deep, in slots 116, 123, 130, 134, 155, and 261. Waste and light weight foreign matter found in air duct.

(b) *Major injuries in ventilating duct of stator.*

Copper exposed and partly burned away in 36-pole coils lying in slots 333 and 357. The adjacent steel spacer plate in the air duct also showed evidence of fusion.

(c) *Damage at the collector end of the stator.*

Insulation entirely burned off the cross connections between coils lying in slots 310 to 360.

Insulation charred on the cross connections between coils lying in slots 1 to 20.

The ends of the coils lying in slots 351 to 360 were displaced toward the shaft and the end of the coil in slot 354 was bent to the left and its insulation torn off.

(d) *Damage at the coupling end of the stator.*

Approximately three and one-half inches of the tooth between slots 353 and 354 burned off and the top coil in slot 354 completely burned out approximately eight inches forward from the end of the laminations. The bottom side of the same coil in slot 346 was also burned off well inside the slot.

The ends of the 36 pole winding lying in slots 345 to 355 were completely burned off. Parts of a few of the 24-pole coil ends directly above these 36-pole coil ends were also burned off.

Insulation entirely burned off the ends of the coils lying in slots 331 to 351.

Insulation entirely burned off the ends of eight 36-pole coils lying approximately 33 to 40 coils to the right of the vertical center line as viewed from the collector end. Insulation charred on all coil ends in the upper part of the stator where the copper was not exposed.

Two separate holes were burned through the sheet metal shield and the expanded metal screen opposite the coil ends which burned off. Flames scorched the paint on the bulkhead opposite; these holes were approximately five feet away.

(e) *Damage to the rotor.*

Solder between band wires melted at both ends of rotor but banding remained intact.

Insulation on both ends of coils damaged from mechanical injury and charred.

There was a semi-circular indentation in one air duct spacer, evidently caused by some metallic substance.

There was a slight mechanical injury to several secondary coils in air duct similar to that in the air duct of the stator.

(f) *General.*

Solder was found on ends of coils and on cross connections at both ends of the stator.

The insulation on coil ends and on cross connections was still glossy on approximately seventy-five per cent of the stator, the fire having been confined to the top of the machine.

(Fig. 1 Motor Stator)

As soon as the preliminary survey of the damage was completed the Westinghouse representative ordered a complete new set of coils, an estimated amount of new iron, and other materials which would be necessary no matter where the motor was repaired. Luckily, it was possible to use a spare half set of coils from a similar installation which was then under construction, and within a few days after the ship arrived at Hampton Roads, enough material was at hand to begin the work.

Meanwhile, enroute from Guantanamo to Hampton Roads the ship's force had made arrangements for complete dismantling of the motor so that no time would be lost in doing this, once the decision to do the work on board was made. In the small space available, this preliminary work in itself was no small task. It entailed work usually done by a navy yard.

When ready for rewinding, the motor was in the following condition: The forward bearing bracket was removed and hung on the forward bulkhead. To take the weight of the rotor, the lift-

ing gear provided an extension shaft which rested in a saddle on the forward bulkhead. The after bearing bracket was secured on the shaft as far aft as possible and the weight of the rotor ordinarily supported by this bearing was taken by a saddle block placed under the shaft and on the turning engine foundation. The ventilating ducts for the motor were broken down in sections and suspended from the deck above so as to be entirely out of the way. The housing for the motors was unbolted and raised about eight feet, the ventilating motors remaining in place on top of the housing. The stator was pushed forward on the track which formed its foundation, so that the stator was clear of the rotor. To facilitate jacking the motor an additional support for the rotor was built up under the forward journal so that the shaft rested in a "V" cut in a ten by twelve block of wood, about eight feet long. The floor plates, supporting angles and oil piping were of course removed. Considering the fact that these motors each weigh about fifty-four tons, the weight almost equally divided between rotor and stator, some idea can be gained of the work connected with the disassembling. Because of the small space available in the motor room all new material was stored on the second and third decks and brought to the motor room as required.

The actual work of rewinding was commenced March 24. The first step was the removal of the old windings. This was accomplished in three or four days. No attempt was made to save any of the old coils, and therefore, to facilitate removal, the closed ends of the coils were cut with a large bolt cutter. With the slot wedges which held the coils in the slots removed, it was then an easy matter to pull the coils which had been cut in halves. After removal they were of value only as scrap but the end connections were carefully disconnected and in most cases used again.

As soon as the old coils were removed from the rotor, work was commenced on laying the new ones. While this was being done, the fused iron in the stator was being removed. It was at first believed that in order to remove the bad iron it would be necessary to take out about one-sixth of all the stator iron. But since all the bad iron was in the top center strake, the iron worker was able by skillful work to renew this iron without removing much more than that which was in the after half of the

strake affected. The difficulty of this particular work was heightened because the stator was in a horizontal position (axially), instead of a vertical position, the latter position being used in the factory when the iron is laid. The damaged portion was also all overhead. The iron work was completed on March 31. The winders were, during this time, laying the coils of the 24 pole winding in the lower half of the stator and in the rotor.

As soon as the coils had been laid in the rotor they were wedged in place. This was delayed somewhat by lack of wedges but while a shipment of these was enroute, work was concentrated on laying the 24 pole stator windings. By careful planning and co-operation between the ship's force and the contractor, no delays were encountered and the work progressed favorably at all times. An estimate of the time necessary for each detail of the work was made and this schedule was followed throughout.

With the arrival of wedges the rotor coils were wedged in place and a preliminary high potential test made. One coil, injured when the wedge was driven, was found defective and replaced. The connections between coils for the rotor were then soldered in place and taped. A final high potential test of 10,000 volts for one minute was made and found satisfactory.

Meanwhile, work was progressing favorably on the stator windings, the 24 pole winding being already in place and the 36 pole winding well under way. Tests of each winding were made as in the case of the rotor and no defects were found. The soldering and taping of the end connections was a very tedious procedure in itself, and was made the more difficult because of the limited space, but the men from the engineer force became proficient in this and as many were kept busy taping as space would permit.

During the high potential tests of the rotor a short circuit had appeared between the slip rings on the rotor shaft, and, therefore, it became necessary to renew the insulation between these rings. This defect was caused by salt water and thereby the deleterious effect of salt water on insulation was again demonstrated. This reinsulating of the slip rings was accomplished by first removing the oil thrower of the forward bearing journal so that the slip rings could be moved enough to put the insulation in place. The oil thrower was removed by first heating with an oxy-acetylene

torch and then applying pressure with a pulling arrangement manufactured on board ship. Similarly it was replaced by heating it until it was large enough to slide into place easily. (Figure 2)

Before completion of the actual rewinding, preparations were made for the varnishing and baking of the windings. Steam coils were placed beneath the rotor and stator and in addition it was planned to use eight three thousand watt electric heaters. The rotor and stator were covered with a large awning to keep the heat localized as much as possible. It was desired to do the baking at a temperature of one hundred degrees centigrade and it would have been next to impossible to keep the entire motor room at this temperature. In addition to this it would have required a much longer time. The motor room, however, was closed up during the baking to prevent loss of heat.

The winding and taping being completed, the first coat of insulating varnish was applied. This was sprayed on and by using four sprayers, each coat was put on in from thirty to forty minutes. At the end of eight hours of the first heating it became apparent that the steam radiators were not accomplishing their purpose and in order to expedite matters additional electric heaters were installed, making a total of twenty-five three thousand watt heaters. The steam radiator coils proving leaky and insufficient were removed entirely.

The reason for trying steam originally was that it was thought dangerous to use electric heating because an explosive gas might be formed in the drying of the insulating varnish. With this arrangement temperatures ranging from ninety to one hundred degrees centigrade were maintained. Spraying was repeated at intervals of twenty hours until six coats of varnish had been applied and thoroughly baked. The spraying and baking thus consumed five days.

Work was then immediately commenced on reassembling the motor. This was accomplished in two days of twenty-four working hours.

Although great care had been taken during the repairs that no foreign substances would get into any of the air ducts or other parts of the motor, the efforts failed. A five-eighths inch washer became lodged between two rotor coils near the closed ends. As soon as the motor was kicked over a few revolutions by power,

it of course flew out and barked the insulation on two rotor and stator coils. Careful examination of the air gap while the motor was jacked over of course had not disclosed the hidden washer.

This made it necessary to disassemble the motor and repair these coils. At the same time all parts of the motor were carefully inspected by several officers and Westinghouse representatives. The work of disassembling, repairing and reassembling was accomplished in thirty hours, and this was considered a good test of the speed with which this type of motor can be broken down. In this evolution it is necessary to break the joints on the ventilating ducts, raise the ventilating blowers clear of the housing, remove holding down bolts, remove top half of forward bearing cap and bearing, rig extension shaft, break all stator and rotor leads to the motor, remove angle irons and gratings, and then slide the stator forward on its track until it is clear of the rotor. Either chain falls or thirty ton jacks may be used for the last operation. The barked coils were carefully taped, varnished and heated by means of a current of hot air and the motor reassembled.

After careful inspection of the air gap when the motor was jacked over, considerable noise was heard. This resembled the bouncing of a few small metallic particles through a small distance. The motor was kicked over several times and investigation of the inside of the rotor each time generally resulted in finding a small piece of copper or other metallic substance. These were always found near the after end, and every indication showed that they were working their way out of the axial air ducts of the rotor. This was a dangerous condition, for if any of these pieces should get in the air gap serious damage to the coils would result.

The motor was, therefore, again disassembled and every air duct, radial and axial, blown through with air at two hundred pounds pressure. This had been done thoroughly previous to the first assembling but at only 100 pounds air pressure. This had evidently been insufficient to dislodge the foreign particles. These had found their way into the air ducts when the old coils were being removed, the pieces of copper in each case being portions of the coils which had been clipped off by the bolt cutters and had then bounced into the entrance of the air ducts at the forward

end of the rotor. These openings had all been carefully closed with rags during the work of rewinding except for the first day or two when old coils were being removed.

Thereupon the motor was reassembled, the entire operation this time having required only twenty-two hours. On this trial everything was satisfactory and the following day the official trials of the ship were commenced. The motor has operated satisfactorily since that day, the ship having in addition to her full power trials and ordinary cruising steamed from New York to Seattle by way of the Panama Canal.

During the period of repair the ship proceeded to the Navy Proving Grounds and successfully carried out the test firing of her entire battery. After the test firing the ship proceeded to Boston, Mass., for docking previous to her final trials and thence to Rockland arriving there for her trials on May 12. With the repairs progressing it was possible, as demonstrated by actual runs, for the ship to steam in the open sea up to about 15 knots.

The causes of the accident were determined by a careful inspection of the motor when it had been disassembled immediately following the accident. This examination showed that the coil insulation had been mechanically injured by some hard substance. This substance may have been lodged in the rotor center air duct and when dislodged produced these injuries. The nature of the mechanical injuries indicated that some of the damage had been done during astern as well as ahead operation. Although the motor was operating ahead when the casualty occurred, a large dint in one of the rotor vent spacers was of such a nature that it must have been made during astern operation. The nature of the distortion of the stator vent spacers and the damage to the insulation indicated that the 36-pole stator winding most probably became grounded in two places, thus causing a heavy local short circuit which started the fire in the insulation of the windings.

From this it can be seen that the greatest care must be exercised at all times to prevent any foreign substances from gaining access to these motors. In order to insure against this and to prevent a possible recurrence of this casualty, all openings to all four motors were fitted by the ship's force, with new screening for their protection. The screening fitted was of heavy wire and with

mesh giving an opening slightly less than one-eighth inch; that being the air gap measurement. Formerly the screening fitted had about one inch mesh except that over the radial air duct which was about one-quarter inch.

The repairing of this motor on board ship was an interesting experiment and demonstrated the fact that major casualties to electric propulsion machinery are no more serious than parallel accidents to any other type of drive; and in addition that the repairs can be effected just as rapidly if not more so.

DISCUSSION

Industrial Organization of Navy Yards

(SEE WHOLE NO. 231, PAGE 761)

LIEUTENANT P. A. CARO, (S. C.) U. S. NAVY.—Commander C. W. Fisher's fine article, "Industrial Organization of Navy Yards," charges, in effect, that the present accounting system does not justify its expense from a local viewpoint.

It may be of interest to note that all of the specific objections raised by Commander Fisher have been overcome here at Charleston and that Commander Fisher himself is the greatest beneficiary of the utilization of the tools provided. The answer to the question "How?" may prove of further interest.

The present accounting administration had and has no expert knowledge of the subject, but came to the duty imbued with a keen desire to make accounting effective in every phase of its operation; i. e., to extract a full return from intelligent use of tools provided. Long observation has taught three important psychological facts concerning the personnel of the U. S. Navy.

First. There is a well defined disposition to beat the game, i. e., accomplish something (for the Navy, of course) in spite of regulations rather than use existing tools for accomplishing the desired end.

Second. A tendency to study carelessly, if at all, information shown on printed forms.

Third. A tendency to "pass the buck" in regard to paper work.

If you are going anywhere it is well to know where you are going and why. With this general principle in view heads of divisions were encouraged to criticize accounting as it existed. There was no difficulty in bringing out criticism. Those noted by Commander Fisher, and many more, were emphasized. Boiled down, the criticisms amounted to:

First. As an information service accounting doesn't justify its existence. Information is received so late that it is worthless; loses its kick in transmission. It is necessary for responsible officers to make intricate calculations before they know "where they stand."

Second. Accounting is no weapon for efficiency, for the reason that it does not give the desired information.

There the problem was fairly stated and the lines along which improvement must come were capable of expression in one word for each branch of criticism; i. e.,

First—Promptness.

Second—Scope.

PROMPTNESS

Up to this point great progress had been made in that the disease had been diagnosed and, assuming that the tools at hand were capable of more effective use, it was evident that the remedy lay in a careful study of the three psychological observations listed above.

It was apparent that the Daily Report of Appropriation Expenditures designed to show all concerned just "where they stood" was worthless four or five days after its date. Furthermore, if this report included tentative charges to appropriations which later became credits, but so much later that the credits were abortive, there seemed little need for its rendition.

The first step indicated, therefore, was a "speed up" campaign and one was inaugurated forthwith. Immediately psychological fact number three reared its head and no matter how hard one hit it, it persisted in showing. The daily report is prepared in the cost section of the accounting office. Inquiry there as to the lateness brought the reply: "We do not get the chits from the time section promptly." The time section reported that "time" did not come in from shops promptly, hence the delay. No effort had been made to determine cause of delay in shops and eliminate it. In short the attitude of the cost section was: "We get the report out in reasonable time after securing the data; delay is not with us." The time section said in effect: "We work the time up quickly when we get it and if the shops are not on the job it's not our fault." The accounting office generally said: "The Report of Expenditures is late, but it is due to the other fellow; we are doing our share and our responsibility and interest cease there." And all of these people were telling themselves and each other how good they were! The next step was a request upon officers in charge of shops to get "time" in not later than 10 A. M. on the day following that on which earned. Co-operation was so good that in less than a week it became a rare thing for "time" to come in as late as 10 A. M. The time required for various operations in preparing "Daily Report" was carefully calculated and charted; the figures proved conclusively that report could be prepared and distributed by 3:30 P. M. of the day following that on which labor and material were applied. Therefore, the office force was required to produce the report before 3:30 P. M. each day. An additional hour was saved by phoning the information to interested parties in advance of typing report.

Up to this point good, but not good enough. Interested parties were still compelled to make allowances for power charges. An investigation of the whys and wherefores of the dissatisfaction concerning power charges showed the situation to be as follows: indeterminate charges were lodged temporarily against appropriations on the basis of productive labor. At the end of the month when the true distribution was known, final charges were made—at fixed price—to appropriations, where the ultimate consumer was known, the balance invoiced into store. Calculations showed that about 70 per cent of the indeterminate cost was being

invoiced—thus operating as a credit to working appropriations, *but too late to be of any value.* Therefore, it was decided to do in the first place what had been done in the last place. Accordingly the power cost situation was carefully scrutinized, the probable percentage of cost to be invoiced into store determined and a rate somewhat lower—to guard against overexpenditure—fixed. This rate represents a percentage of the total indeterminate power cost and the percentage is shown in money each day charged to naval supply account. This leaves the appropriation expenditures and balances net for all practical purposes. A new rate is set each month after careful survey of the situation, future plans, and past cost.

The effectiveness of report was further improved by a device to take care of retirement fund deductions. Over a long period of time this was found to average 2.2 per cent. Therefore the allotments granted by the department are shown on report, but just below, in parenthesis, is shown a sum which represents allotment increased by 2.2 per cent of itself (allotment divided by .978). As expenditures are shown gross, available balance is apparent at a glance.

Special public works projects are shown separately. It is believed that report of expenditures is now as complete as anyone could desire. The information is accurate and reaches parties concerned in less than six working hours after time is earned and material applied. If anyone outside of the accounting office touches a pencil to discover "where they stand" they have a passion for figures. These items appear to cover the specific criticisms mentioned by Commander Fisher. It will be noted that the improvements were accomplished with the tools at hand, i. e., the accounting system as was and is.

The "speed up" program was not confined to daily report. Operations involved in preparing reports of expenditures, expense statements and stores returns were observed, timed, and charted. Causes of delay were determined, very much in the manner described in regard to daily report. The difficulties were taken up one by one and the work so arranged and personnel shifted that they gradually disappeared. It was realized that an expense statement for November received in January or February could be no potent weapon for efficiency or effectively indicate points of leakage.

Both reports of expenditures and expense statements are now rendered promptly.

SCOPE

With reasonable promptness assured, attention was next turned to scope. A casual study of accounting forms indicated that almost any desired information could be gleaned therefrom.

Why, then, was this information not used to promote efficiency? There is no doubt that the answer lay in the second psychological trait, i. e., the general indifference to printed forms. At this point the problem was clearly stated, i. e.: "Furnish the same information, graphically, in such form that salient points will attract quick attention. Monthly, as soon

as pencil figures are available a memorandum is forwarded to the manager in letter form, comprising a complete analysis and comparison by shops of indeterminate expense. A table is submitted showing production, expense, ratio of expense to production, number of men and supervisors by shops. This information is shown for the month just closed and the preceding month in parallel columns. A second table shows principal items of expense, such as leave, supervision, etc., by money expended and percentage of total expense in parallel columns for the months concerned. Other tables compare total expenditures for all purposes, total production and ratio of indeterminate expense to production. The tables are supplemented by comment offered for the purpose of emphasizing seemingly undue expense, and suggestions as to remedy. Sometimes other points are covered. For instance, stores balance sheets, or fixed expenses, are analyzed and compared with production. This gives the manager by the middle of the month a complete résumé of the previous month's business and compares it with that of the month before. This information indicates shops which are carrying a heavy burden of expense and also indicates whether or not the expense were avoidable.

There is a strong tendency in the navy to slight the tools provided. The writer has frequently seen naval people pick out some law or regulation which prohibits this or enjoins that and spend valuable time devising ingenious schemes to "beat the game," i. e., "get around it." Several of these cases have been privately investigated—experimentally—with the result that usually an easy quick way of accomplishing the desired purpose has been found "within the law."

The accounting service is not perfect, but it is certainly capable of more productive use than is being made of it. Many fine tools are provided. Alexander did not sever the Gordian knot with the back of his sword.

A Program for Naval History

(SEE WHOLE NO. 232, PAGE 973)

CAPTAIN ROBERT H. WOODS, (S.C.) U. S. NAVY.—I read recently in the June number of the NAVAL INSTITUTE PROCEEDINGS the article entitled "A Program for Naval History" by Captain J. M. Scammell, Inf. R. C., U. S. Army. The author in certain of his statements in regard to the *Records of the War of the Rebellion* shows such gross ignorance and casts such an unwarranted slur upon the compilers of those records that I cannot let his article pass unnoticed.

To begin with, he has missed the conception and object of the publication of those records. They were collected and published with the express purpose of preserving them for all time so that historians throughout the country could have easy access to them and could use the official facts on which to base their conclusions; in other words, the source from which to write "the intelligent history" so devoutly desired. No greater or more useful publication for this purpose has ever been issued by any government. They were never meant to be history, but simply official facts on which to base history. If such a commission of military and

scholarly experts (as suggested by Captain Scammell) had been authorized to prepare a staff or military history of the Civil War from the original official records, scattered as they were throughout the country and in thousands of volumes in the various government departments, it would have taken them a hundred years to have searched out their facts, and by that time many of the original records would have been lost or destroyed, leaving the experts nothing to back up their facts and conclusions.

The author states on page 976 as follows:

"During the period when the wicked general staffs were producing their militaristic literature, with our customary virtue we were engaged in publishing our own military records in such a manner as to render them useless for any warlike purpose. The *Records of the War of the Rebellion* were printed at a monumental cost. What could have been and should have been a priceless collection was turned into an abortive effort because the publication being a political maneuver and not a scholarly or military undertaking, was entrusted neither to scholars nor to military men, but political appointees. The manner in which such things are done by our government is in exasperating and pathetic contrast with the intelligent methods of any other state. One collection bears this notice:

"'Edited by the clerk of the joint committee on printing.'"

In the next paragraph the author compares the futility of the *Records of the War of the Rebellion* with ponderous labors—worse than useless; historically false. The above statements are without foundation and unwarranted in almost their entirety. The *Army Records* were published by a Board of Publication, the head of which was always a high military officer of the regular army, among whom were Colonel Scott, Major George B. Davis, and Major George W. Davis—all distinguished and scholarly officers and men. To insure the impartiality of the work, distinguished participants of both the Union and Confederate Armies were employed on the work, among the latter being General Marcus J. Wright, General L. L. Lomax, and General Field, all men of high military and scholarly attainments. Two other members of the Board of Publication were civilian appointees: these men were selected for their thorough knowledge of and familiarity with the records of the War Department; but the guiding hand was the military head of the Board.

The preparation of the *Naval Records of the War of the Rebellion* was begun under Professor James Russell Soley, U. S. Navy (afterwards Assistant Secretary of the Navy under Secretary Tracy), a distinguished graduate of Harvard, a man of scholarly attainments, and one of the best informed men on naval history and international law in the country. He was succeeded by Lieutenant Commander F. M. Wise; he, by Lieutenant Commander Richard Rush; and he, by Professor E. K. Rawson—all of the U. S. Navy. The work of publishing *Naval Records* was begun under Lieutenant Commander Rush. As I claim the entire

responsibility for the plan and arrangement of the publication and the accuracy of those records up to and including Vol. 8, I feel that it is necessary to state my qualifications for the position and how I obtained it. I am a graduate of the U. S. Naval Academy, and was legislated out of the navy under the Act of Congress of August 5, 1882, which permitted only the first ten of each class to be taken into the service. Professor Soley, in order to get a Naval Academy graduate as principal clerk on this work, prepared an examination covering almost the entire naval technical course at the Naval Academy. The examination was held by the Civil Service Commission and thrown open to the public; it lasted five days; though many started it they dropped out very fast; only two passed, both Naval Academy men; I passed far ahead on the examination and received the appointment. Politics had nothing whatever to do with it. Besides myself there were sixteen other Civil Service employees engaged on this work and an ex-Confederate naval officer for the collection of the Confederate records scattered throughout the South; but aside from copying and verifying from the original records and proof reading and indexing the volumes when printed these employees had nothing to do with the work. The work of selecting from the vast mass of records, collating, arranging and proof reading for technical errors was done by myself alone. After I gave up this work in 1898 and entered the Pay Corps of the navy my place was taken by Mr. Charles W. Stewart, a graduate of the U. S. Naval Academy, Class of 1881. Politics had nothing to do with his appointment. He is one of the best informed men on naval history in the country. Later on he was put in entire charge of the work and brought it almost to its completion.

In closing I have to state that none of the volumes of the army or navy *Records of the War of the Rebellion* bear any such notice as "Edited by the Clerk of the Joint Committee on Printing."

SECRETARY'S NOTES

Membership Life, regular and associate, 4818.
New members, 13. Resignations, 10. Dropped, 2.

Deaths, 3: Rear Admiral U. Sebree, U. S. Navy;
Lieutenant P. K. Presnell, U. S. Navy;
Ensign Frank Miller, U. S. Navy;

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The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished can be greatly reduced if the reprints are struck off while the article is in press. Twenty copies of reprints are furnished authors free of charge. Authors are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted.

INFORMATION INDEX

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER F. W. ROCKWELL, U. S. NAVY

and

LIEUTENANT COMMANDER J. B. HEFFERNAN, U. S. NAVY

FRANCE

THE 1923 BUDGET.—The 1923 navy budget is the most important since the Armistice. A slight effort is being made to regain lost time, as well as a timid attempt at cutting down useless expenditure. Whereas 798,000,000 francs make up the total navy expenditure in the current year, no less than 1,122,000,000 francs are to be spent on the fleet in 1923, including 329,500,000 francs for the preliminary shipbuilding programme. In truth, that sum is large only on paper, when is considered the tremendous cost of labor and building materials in France.

France, which was in 1914 aiming at possessing a fleet of 28 battleships, 10 scouts, 52 destroyers, and 94 submarines (Lapeyiére programme), may safely be considered to have finally given up competing for line-of-battleships and weight of broadside excellence, partly as the result of the financial difficulties caused by Boche devastations and partly also as the consequence of the great change in the minds of experts as to the war value of heavy armourclads. The half-completed 25,400-ton *Normandies*, which France discarded long before the Washington Disarmament Conference, have every chance to be the last French battleships. Fast cruisers, powerful and swift contretorpilleurs and torpedo-boats, together with swarms of underwater and aerial mosquitoes, such are the branches of construction in which France means to excel. Her efforts are to be centered on weapons that can be manufactured in a few months, and not in a few years, and that are susceptible of being multiplied during a protracted war. In this respect the lessons of the last conflict have not been lost, and by degrees French dockyards will adapt themselves to the new requirements. Thus it has been decided that Lorient and all other arsenals are to be equipped for submarine construction, and, next year, for the making of aerial weapons as well. The great war has demonstrated the faculties of adaptation of Gallic "chantiers,"

and in the light of the 1914-18 experience the *fait nouveau* has to be faced that the power of navies is measured, to a large and growing extent, by the capabilities of their yards and factories. The recognition of this truth is the main argument of those who oppose the proposed reduction in the number and importance of state arsenals, of which there are more here than in England.

The 600-ton and 14-knot submarines "de moyenne patrouille" will be called *Sirène, Ariane, Circé, Calypso, Naiade, Ondine.* The first-class submersibles of 1,000-1,100 tons and 16 knots (two 1,400 h.p. motors) will be known as *Requin, Morse, Narval, Dauphin, Marsouin,* and *Souffleur.*

The torpilleurs of 1,400 tons, 30,000 h.p., and 32.5 knots, four 4-inch guns, two anti-aerial 75 mil. and two twin 22-inch torpedo-tubes, will be designated *Bourrasque, Cyclône, Mistral, Orage, Ouragan, Sicque, Sirocco, Tempête, Tramontane, Tighbe, Typhon, Tornade.*

The 2,500-ton destroyers (48,000 h.p., 35.5 knots, six guns of 4-inch, two of 3-inch, and six 22-inch torpedo-tubes, five boilers, and a radius of action of 2,600 miles at 18 knots), will be named *Jaguar, Panthère, Léopard, Lynx, Chacal,* and *Tigre,* which are new appellations. These contretorpilleurs will be strongly built for ocean work, and reproduce the good points of the ex-German *Senès,* but if the 4-inch caliber is retained (instead of the new 130 mil. type at one time proposed), they will be dangerously inferior to the fine Italian *Leones,* that carry up to eight guns of 4.7-inch and have, besides, reached 37 knots on trial. Still, Paris experts have, apparently, special reasons to maintain that the French *Jaguars* represent the most powerful type of destroyer designed up to date.

Lastly, the cruisers of 8,000 tons (100,000 h.p., eight boilers, 34 knots, a radius of action of 4,875 miles at 15 knots, eight long caliber guns of 6-inch bore in twin armored turrets, four 3-inch guns, and twelve 22-inch torpedo-tubes) have been named *Duguay-Trouin, Lamotte-Piquet,* and *Primauguet,* that are old naval appellations, reviving some of the most glorious names in maritime annals.

The 1923 budget provides also for the modernizing of all dreadnoughts in service, that are becoming new ships so far as the range and other capabilities of their guns and torpedo armament are concerned, and also their fitness to resist submarine explosions. Aerial fire control and defence against submarines and seaplanes have received special attention as well as wireless signalling appliances. This rather heavy item of expenditure is being criticized as coming too late in the day to much improve the French naval situation. Just over 7,400,000 francs are earmarked for the continuation of artillery experiments afloat and ashore, the main tests to be with 18, 9.4 and 7.6-inch calibers and with new types of shells for future ships. A new testing range for supercannon is being prepared in the Landes "department," along the seashore. Experiments will also go on with coastal guns, mostly in the Toulon school, pending the adoption by the Chambers of the new "Défense des Côtes" programme.

The aeronautical expenditure, from 37,000,000 francs in 1922, is raised to 62,000,000 francs in 1923; thus a substantial increase is made that is justified by the urgent need of new seaplanes, new hangars, and also of more intense training. The fitting of the *Bearn* as a seaplane carrier is not included in this outlay. The ex-Zeppelins *Dixmude* and *Mediterranée* are to be used as training schools for the dirigible personnel. Extra pay is to be allowed to the flying personnel. Moreover, Minister Raiberti is understood to be giving the finishing touches to a "programme aéronautique d'ensemble," intended to make up for the actual weakness of France on the water

A sensational cutting down had been announced of the unmilitary expenditure, but few economies have as yet been realized, when compared with the retrenchment observed in the British navy. Tribes of blood-sucking parasites keep on weakening the Marine Francaise, that counts over 36,000 civilian employés, of whom 30,000 are arsenal workmen; 9 ports militaires and naval factories, 95 flag-officers (of whom 50 are non-fighting), which is truly out of proportion with a combatant personnel of 55,000 and a fleet of seven battleships in full commission. It is intended to bring down the number of arsenal hands to 26,000 in 1923, to suppress Rochefort, and reduce Cherbourg, Lorient, and Bizerta to the rank of secondary bases, only keeping Brest and Toulon as "ports militaires de premier rang," but, in the light of past experience, the electoral considerations that govern the Republican navy will not permit these reforms to be realized.

Activity prevails in the French fleet. Long-range artillery tests by day and by night have been going on both on the Brittany coast and in the Middle Sea, and gratifying results obtained, showing Gallic canonniers are retrieving their traditional excellence. The thickly-armored *Prinz Eugen* was in a few minutes, at 16,000 yards, sent to the bottom by the 12-inch salvos of the battleship *France*. The submarine force is giving proof of seaworthiness and endurance, and there are signs that the initiative of submarine commanders is being developed perseveringly. Sea practice is being acquired by all classes of units. The 12,600-ton armored cruiser *Michelet* is showing the flag in the Baltic, the *Ferry* is commissioning at Bizerta for the Indian Ocean, and the 4,200-ton and 26-knot *Colmar* is replacing on the Far Eastern Station the worn-out *Montcalm*. The aeronautical stations are being attended to and strengthened, the obvious will of Minister Raiberti being to have in hand a really war-worthy fleet. —*Naval and Military Record,* 21 June, 1922.

THE "BÉARN" AS A SEAPLANE CARRIER.—What is the best type of seaplane-carrier? Toulon experts, who are giving the last touches to the designs of the aerial installations in the seaplane-carrier *Béarn,* after lengthy tests, are satisfied that she will prove a splendid seaplane platform, owing to her size (190 mêters long, 30 wide) and to the ample space provided for scouting and bombardment seaplanes of the various types, for repairing workshops, and for bomb and oil stores. The worth of a seaplane-carrier is, in the first place, expressed by the number of fully-equipped fighting planes which she can put into the air, whereas tiny mother ships of the *Bapaume* type (800 tons, 75 mètres, deckplace reduced by superstructures), carrying three or four small planes, are of little use for offensive work.

The value of high speed is a controversial matter. The *Béarn,* with her 23 nominal knots (certain to be exceeded in practice), will do either for service with the battle squadron, which she would considerably strengthen, or for independent work in the Middle Sea, in which case she would be escorted by seaplane-carrying cruisers. Of course, she will be made unsinkable as far as technical developments permit. Her speed, besides, would enable her to avoid too close contact with battleships, as there are only pre-war dreadnoughts in the Mediterranean more or less inferior to their paper speed. In the mind of enthusiastic aerial experts the *Béarn* type, with a bit more speed, is the fighting ship of the future. The fine British super-dreadnoughts that visited Toulon they consider in the way of targets, whereas the British seaplane-carrier squadron is to them a matter of wonder and admiration; and they insist that seaplanes, however reduced in size or in number, ought to be part of the armament of all warships, submarines included.

With the coming of the summer the aerial fever has seized the whole of France, extending also to the navy. Aerial fêtes are preparing or

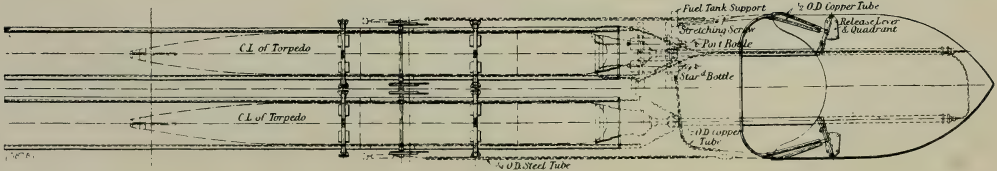
taking place in a dozen centers at once, with the co-operation of those efficient aviation regiments that are the spearhead of the French army. Toulon and Bordeaux have also seen naval aviators at work, in speed, machine-gun, and bombing contests, and if *La Brise,* the Pornichet-St. Nazaire Journal, is to be believed the *côte d'amour* seaside resort is also to witness this summer an impressive aerial pageant by fleet aviators. Growing public interest in aviation, fruitful emulation between seaplane manufacturers and motor makers, more pupil aviators—such are the results expected. From several sources of information it looks as if this year would mark sensational strides in the speed and carrying power of flying machines, which will mean further changes in the conditions of warfare.

Great satisfaction reigns at Rue Royale concerning recent results obtained in aerial and submarine torpedo practice as well as in gun tests. At a range of about 14,000 yards in hazy weather, off Toulon, 25 shells of 540 kilos fired by the *Bretagne* transformed the ex-*Prinz Eugen* dreadnaught into a helpless wreck, her belt smashed in, a turret destroyed, a funnel gone. Lieutenant Pelletier has just flown without stop from Tunis to Paris in a *Breguet* fitted with a 300 h.p. Renault motor, a far-reaching performance.—*Naval and Military Record,* 19 July, 1922.

COASTAL MOTOR BOAT FOR FRENCH NAVY.—Whatever may be the ultimate decision as to the employment of light craft in naval warfare of the future, there can be little doubt that the class of small high-speed torpedo vessels propelled by internal-combustion engines, and known as coastal motor boats (or more familiarly as C. M. Bs.), will play an even more important part than they did in the last war. The form of hull employed in these vessels, which are of the skimming type, was developed by model experiments carried out by Sir John I. Thornycroft over a period of ten years or so prior to the war, the object being to produce a form having a very low resistance combined with good seagoing qualities. Tank experiments alone were not sufficient to determine the best proportions and form, and actual boats which were built and tried at sea by Sir John's son, Mr. Tom Thornycroft, played an important part in the developments. The boats of this class constructed before the war, however, were only employed for racing and experimental purposes, carrying not more than two or three men, and just sufficient fuel for the completion of a race. Considerable modification was therefore necessary to render them suitable for carrying one or two torpedoes, each weighing about 15 cwt., as well as the fuel supply necessary to give a useful radius of action, the crew of three or four men required to work the boat under war conditions, and the discharging gear for the torpedoes. However, at the period of the war when Admiral Sir Henry Jackson was first sea lord, it was decided that motor torpedo boats should be built, and Messrs. John I. Thornycroft and Co., Ltd., whose London address is now Thornycroft House, Smith Square, S. W. 1, were given instructions to build, as quickly as possible, twelve experimental boats of the special form of hull to which reference has been made. Further experiments were carried out, and the designs prepared for 40 ft. and 55 ft. boats, of which a large number was eventually built by Messrs. Thornycroft themselves and several other firms acting as their sub-contractors from 1915 to 1918.

A full account of the exploits of these vessels would form extremely interesting reading, but the utmost secrecy was naturally observed regarding their construction and employment during the war, so that, for a considerable period, the general public was quite unaware of their existence. Very little has been published on the subject since the conclusion of hostilities, but it is now known that the vessels were first employed in the winter 1916-17 at Dunkirk, from which base they were

Fig. 1



Fuel Tank Support
½ O.D. Copper Tube
Release Lever & Quadrant
Stretching Screw
Port Bottle
Star^d Bottle
O.D. Copper Tube
¾ O.D. Steel Tube
C.L. of Torpedo
C.L. of Torpedo

Fig. 2

frequently in action with German patrol boats and destroyers. For work in the North Sea they were based at Harwich, and armed with depth charges, as well as with torpedoes, were effectively employed in countering the submarine menace. They were also used for laying mines in positions which were inaccessible to ordinary mine-laying craft. More striking, however, was their work in connection with the blocking actions at Zeebrugge and Ostend in 1918, and, after the armistice, in the attack on Kronstadt. It will be remembered that the Russian cruiser *Oleg* was first torpedoed by a coastal motor boat outside Kronstadt Harbor and that afterwards several Russian vessels were destroyed in the harbor itself in an action that was unique in naval history.

That the possibilities of coastal motor boats are now being considered by other naval powers may be gathered from the fact that Messrs. Thornycroft have received orders for them from the French, American, Japanese, and other governments, so that the particulars of their design and construction we are now able to publish should be of considerable interest. The boats built for the French, American, and Japanese navies are practically identical with those employed by H.M. navy during the war. In all, four sizes have been developed and built, two being 40 ft. and 45 ft. in length respectively, and each carrying a single torpedo; one 55 ft. in length carrying two torpedoes, and one 70 ft. in length carrying three or more torpedoes. The majority of those built have been of the 55 ft. type, and it is a boat of this size, supplied to the French government, that we are about to describe in detail. This boat is designed to carry two 18-in. torpedoes and two depth charges. Mountings for two Lewis guns are also provided, mainly for the purpose of resisting aerial attack. The other main dimensions of the hull are: Beam, 11 ft, and draught, 3 ft. 3 in., the latter figure, of course, being taken when the boat is at rest. When travelling at full speed, the whole of forward portion of the hull is above the water level, the boat then being supported by the dynamic lift supplied by the inclined surfaces formed by the step amidships and the extreme after end of the hull. The draught in this condition is only a few inches, as will be gathered from Fig. 1, which shows the boat travelling at 41.6 knots—the mean speed attained on trials in the fully-loaded condition.

* * * * * * * *

Before describing the torpedo-releasing gear it should be explained that one, or both, of the torpedoes is discharged over the stern of the boat, while the latter is travelling at full speed in the direction of the objective. As soon as the torpedo is launched, the course of the boat is altered so that it clears the objective, and the torpedo, of course, continues to travel in the original direction. It will be understood that there would be no danger of the torpedo striking the boat itself, even if the course of the latter were not changed, since the torpedo sinks to a depth of about 6 ft., and would therefore easily pass under the hull. Moreover, the speed of the torpedo does not greatly exceed that of the boat, so that a considerable time would be required for the former to catch up. To assist in aiming the torpedo, the director gear indicated in Figs. 1 and 2 is provided on the steering shelter. The gear consists of an arm carrying a pointer and moving over a graduated quadrant.

* * * * * * * *

When the boat is to be used for mine-laying, the mines are carried in the torpedo troughs, as indicated in Fig. 2, and this illustration also shows the sling plates provided for lifting the boat out of the water and carrying it on a larger vessel. The sling plates are fitted at the after end only, the forward end being supported by a wide canvas band.

* * * * * * * *

Having now completed the description of the main features of the vessel and its equipment we may conclude our article by a brief reference to the voyage made from Westminister to Cherbourg on December 7 and 8 last, when the boat was delivered to the French naval authorities. Personal references are usually undesirable in a technical description, but we think it is of sufficient interest to refer to the fact that the boat was navigated to Cherbourg by Lieut. J. W. Thornycroft, R.N., the grandson of the designer, who was himself running the trials of his first torpedo boats there 45 years ago. The boat left Westminister Pier at 11.45 A. M. and arrived at Dover at 2.6 P. M., the intervening distance of 82 miles having been covered in 2 hours 21 minutes; the mean speed was therefore 34.9 knots. The next stage of the journey, from Dover to Portsmouth, a distance of 106 miles, was covered in 3 hours 5 minutes, the mean speed on this stage being practically the same, viz., 34.4 knots, although a heavy swell and some fog were encountered *en route*. The journey from Portsmouth to Cherbourg, 77 miles, was completed when strong tides and a rough sea, which became worse as the French coast was reached, had to be contended with. The time taken for this part of the journey was 2 hours 30 minutes, giving a mean speed of 30.8 knots. The total running time for the whole trip of 265 sea miles was thus 7 hours 56 minutes, and the average speed from Westminister to Cherbourg comes out at 33.4 knots. This, we think, is a very creditable performance and is effectual evidence of the seaworthy character of the boat.—*Engineering,* 5 May, 1922.

GREAT BRITAIN

EDITORIALS ON AIRSHIP POLICY.—It appears from an announcement in *The Times* that official interest in the future of the airship has suddenly revived. Both the admiralty and the air ministry are understood to have signified their willingness to set aside funds for lighter-than-air craft development, and to lend financial support to the Burney scheme for establishing an Imperial airship service.* The air ministry wishes to retain this control in its own hands, whereas the admiralty are believed to have made their offer contingent upon the transfer of such control to them.

A Substitute for Cruisers?

According to *The Times,* the Admiralty propose to find the money for airship development by taking part of the funds already voted for light cruiser construction. As no new light cruisers have been laid down or authorized since the armistice, this can only mean that the completion of the few remaining vessels of the war program is to be retarded. They are four in number, viz., *Frobisher, Effingham, Enterprise,* and *Emerald,* but all represent types to which naval opinion attaches great importance. On the other hand, if the admiralty consider airships to be needed more urgently than additional light cruisers, they would, of course, be justified in substituting the former for the latter. It is a mistake to suppose that the board has ever viewed airships with disfavour.

It was undoubtedly the influx of officers from the Grand Fleet at the end of 1916 that led to the vigorous policy of airship construction which was adopted in the following year. During his tenure as Commander-in-Chief Lord Jellicoe conceived a high opinion of the Zeppelin as a naval scout, and, as he states in his book, "The Grand Fleet," he regarded one of these vessels as equivalent in value to three light cruisers for reconnaissance in favourable weather conditions.—*Naval and Military Record,* 21 June, 1922.

* These funds were refused after the Burney scheme had been investigated by a committee.—Editor.

Lord Lee, first lord of the admiralty, addressing the 1920 Club in London on Thursday, said there was a class of enthusiasts who were, he thought quite mistakenly, at the present time depreciating the navy, and who had an extreme enthusiasm for air development.

"And here I am most anxious not to be misunderstood. I am not referring to the legitimate and long-overdue development of the air service. I have always been an enthusiast for the development of the air service, but I am referring to those wild and reckless statements that have become the occasion of journalistic stunts, and which are prevading a section of the press to-day, based on no scientific fact, but merely on a desire to be sensational.

"It is certain that the admiralty and the navy are not opposed to the development of the air service, but they are crying out for it, because the air service to the fleet has become quite as vital as the torpedo. We cannot be accused of trying to hold back, but the navy must have control over its air service. The air service is as much a portion of the fleet and should be as much under its direct control as the gun or the torpedo.

"The only complaint that the admiralty have to make against the air service is that, firstly, it is not developing fast enough, and, secondly, it is not under the control of the fleet. The air service should not be developed at the cost of the proved and tried weapon on which we have had to rely in the past, and on which we shall have to continue to rely."

Not a Substitute for Navy

He wanted to make it clear that the air service, however well developed, could never be a substitute for the navy. Food could only come safely overseas during war under the guardianship of the British navy. If the extreme contention of the air enthusiasts were accepted, that the battleship was no good because it could be sunk by one bomb, he could only say it was not supported by any evidence of a scientific nature. If they carried that argument to its logical conclusions, no ships could float the seas during an air attack. The aircraft carrier, the cruiser, and the merchantman would all be sunk.

"I do not underestimate the value of the air service, but, believe me, it does not spell the end of the British navy. The admiralty claims today that it has already discovered and embodied in a design an antidote for all these new methods of attack, whether by torpedo or by bomb. We are not in the least anxious about our position so long as we are allowed to go on with our work."

Defending the action of the admiralty in proceeding with the building of the two new post-Jutland battleships, Lord Lee said that to talk about the maintenance of our naval position as so much sentiment was surely the most rank and stupid heresy that could be imagined. Those who said that there could be no more wars were tempting providence, and taking risks which no one had the right to take.—*Naval and Military Record*, 19 July, 1922.

It has taken a prolonged and vigorous press campaign to rouse the air ministry from its lethargy and open its eyes to the fact that we are now confronted with a situation that even the Secretary of State for Air does not regard "without feeling grave alarm."

There are signs that the admiralty, who have long chafed under the anomalous system which denies them any real control over their own air service, are at last in open revolt. The first lord made a very outspoken speech at the 1920 Club last week, insisting that the navy must run its own air service, which had become as much an integral part of the fleet as the gunnery or torpedo branch. The admiralty's complaint, said Lord Lee, was, first, that the flying service was not developing fast enough, and,

secondly, that it was not under the control of the fleet. This, of course, is no new revelation, and to those who are familiar with the facts it has been a matter for astonishment that the admiralty should for so long have acquiesced in an arrangement which makes it utterly impossible to build up an adequate and efficient air service for co-operation with the navy.

The whole trouble is that the navy's air requirements are to a large extent dictated and controlled by men who are either soldiers themselves or influenced by military service, and who are consequently unable to grasp the fact that an almost fundamental difference exists between the functions of naval and military aircraft. In the opinion of the navy the principle of a unified air service has been utterly discredited by experience and should be scrapped without further delay.

The breach between admiralty and air ministry has now been widened by the latter's dog-in-the-manger attitude towards the question of airships. According to *The Times,* it takes the line that if it cannot control airships itself it is anxious that no other department should have them, while the admiralty, on their part, attribute so much importance to the provision of airships that they are prepared, if the Burney scheme falls through, to build such vessels at their own charge. The crisis which has now arisen will indeed prove a blessing if it results in the emancipation of naval aviation from military leading strings. It is true enough, as we recently reported, that a fairly generous percentage of the money available for experimental building has been devoted of late to naval type machines, but unfortunately the air ministry has been spending so lavishly on ground establishments that funds for other purposes are exceedingly restricted, and the present flying equipment of the navy is quite inadequate even for the minimum requirements of peace training.—*Naval and Military Record,* 12 July, 1922.

Public confidence in the government's air policy has been rudely shaken by last week's disclosures as to the plight of naval aviation. That the fleet was short of planes and pilots had long been common knowledge, but few outside the service can have realized the full extent of the deficiency. The figures given by Mr. Amery on Wednesday are positively appalling. For the entire British navy, which includes 15 capital ships in full commission, only six fighting aeroplanes are available, and, according to Viscount Curzon, it is more than doubtful whether these six are still intact. The only other machines attached to the fleet are 18 reconnaissance planes, 12 torpedo planes, and 18 spotting planes, It must be obvious to the merest tyro that these figures bear no relation whatever to the actual requirements of the service in respect of air material, even in peace time.

With such a shortage of machines it is quite impossible to work out any useful scheme of co-operation between surface ships and aircraft either for offence or defence. There has been, for instance, a great deal of talk about the possibilities of long-range fire controlled by aircraft, but we very much doubt whether any thing can be done in this direction until the number of spotting planes is largely increased. Then, again, the public had been led to believe that the development of the torpedo plane was receiving great attention, whereas it turns out that the navy has only a dozen machines of this type. But the dearth of fighting machines is by far the most serious matter, as a moment's reflection will show, for it threatens the very foundations of our post-war naval policy by raising in a form more acute than ever the question as to whether it is desirable to spend so much money on maintaining battleships in commission and building new ones.

Not Enough Fighting Planes

Since aircraft have admittedly become a serious menace to surface ships, the perpetuation of great ships costing £8,000,000 apiece and carrying upwards of 1,200 officers and men can be justified only on the assumption that they will be adequately protected from the attentions of hostile aircraft, protection which can only be given by other aircraft. The chief function of the fighting plane is to drive off or destroy enemy aeroplanes which may attempt to attack the fleet with bombs or torpedoes. We think it will be admitted, even by the warmest partisans of the great ship, that a battle fleet sailing in enemy waters without an adequate force of fighting planes would find itself in a very precarious situation if attacked by heavy bombers and torpedo-carriers. It may, of course, be argued that the navy's aviation service would be promptly reinforced in the event of war, but in view of the virtual collapse of the aircraft building industry it is more than doubtful whether this could be done in time. The main point is, however, that the navy has been badly let down by the air ministry, and is now rightly insisting on the deliverance of its air service from the paralyzing grip of incompetent bureaucrats.

The announcement of the formation of "two air defence brigades, territorial army, for the defence of London," leaves us quite cold. No amount of ground troops equipped with 3in. guns would avail to guard London or any other city from air bombardment if we ever again found ourselves at war with a great Continental Power. It is difficult to resist the suspicion that this announcement has been made to distract public attention from the real issue. Many of the newspapers and of those people who write letters to them exhibit a touching faith in the future of civil aviation, upon which, they declare, we must rely as the surest means of building up an air fleet available for war service. But irrespective of the limited utility of civil machines for war work, there remains the notorious fact that our civil air fleet, never of large dimensions, is steadily shrinking. Last month it comprised only 83 machines of value for war purposes, according to the air ministry's statistics. Clearly, therefore, civil aviation is a broken reed so far as its value for national defence is concerned.

No public man seems to have the courage to tell the nation what it really needs and what eventually it must have—that is, an independent air force consisting of say, 1,000 machines specially designed for war service, with the necessary personnel, equipment, etc. The possession of such a force would make us reasonably safe from aerial attack, since no neighboring power would be likely to send bombing machines over our cities if it knew for certain that retaliation on at least an equal scale would swiftly follow. No doubt it would cost a great deal of money to create and maintain in England a standing force of 1,000 aeroplanes —including several hundreds of the heaviest bombing machines—in addition to all the other aviation material required for special navy and army service, but it is an expenditure that will certainly have to be faced sooner or later. When all is said and done, we pay out vast sums each year for the upkeep of naval and military forces which are intended solely for defence and not expected to make any direct contribution to the commerce and industry of the realm. Why, then, should the provision of an adequate air fleet always be made contingent on the development of civil aviation?—*Naval and Military Record*, 19 July, 1922.

BRITISH AIR FORCE TO HAVE 500 PLANES.—London, Aug. 3.—Great Britain has decided to provide a home defense air force of 500 airplanes, Premier Lloyd George announced in the House of Commons this afternoon.

It has been decided further to spend an additional $10,000,000 annually to protect England from the air.

A large section of the British press has been clamoring for weeks for government action to strengthen the air defenses.

The *Daily Express* from time to time has been printing powerful editorials on the first page stating that Great Britain is practically defenseless in the air.

It was pointed out by the newspapers and by officials of the army and navy that France is the only nation in a position to attack Great Britain by air, and all were very careful to say that no danger is felt from that quarter. It is this circumstance which adds mystery to the public demand for strengthened air defenses.

There is one section of official opinion which believes that "the next war" will be won through a combination of air and chemical weapons. Those holding this view think that airplanes will be perfected to the point of silent flight and that large squadrons of them will be able to drop bombs containing poison gas which will wipe out not only armies but the civilian population.—*Baltimore Evening Sun,* 3 August, 1922.

Developing the Aircraft Carrier

All the principal admiralties of the world are paying marked attention to the provision of aircraft carriers, a type which is now regarded as only second in importance to the capital ship, some naval experts both here and in the United States believeing it to be even more indispensable. The American navy contains as yet only two carriers, one a converted fleet collier and the other a rebuilt cargo steamer, both of which suffer from the drawback of low speed; but plans have now been prepared for the transformation of two huge battle cruisers into floating aerodromes. The ships in question, originally designed on a basis of 43,500 tons and a speed of 33¼ knots, are to be cut down by some 11,000 tons, with corresponding modifications in armament and armour, and fitted with spacious flying decks. Their great dimensions, 874 feet over all, with a width of 101½ feet, render them well adapted to this new rôle, though some critics consider it bad policy to employ vessels of such enormous size and cost for work that is bound to prove extremely hazardous in war-time.

Japan is pursuing the same policy, for she is now busy converting the two 43,500-ton battle cruisers *Amagi* and *Akagi* into aeroplane carriers, the displacement in each case being reduced to 26,500 tons. These vessels also are expected to attain a speed of 33 knots. All four ships will be superior to anything we have got or are likely to have in the near future. Our swiftest carrier is the *Furious,* now undergoing alterations at a cost of about £300,000. She can steam at 31 knots, but her normal displacement is only 19,100 tons. The converted battleship *Eagle* is a 24-knotter, of 22,790 tons, which seems to have proved a very qualified success in her new character, judging by the time she has spent in dockyard hands since her first commission. The *Hermes* and the *Argus* are both excellent ships in their way, but, of course, cannot be compared with the new foreign carriers either as to speed or capacity for transporting aeroplanes. The truth is, however, that we have far more aircraft carriers than aircraft to put into them, and before any more money is spent on improving the carrier fleet it would be well to make sure that a sufficient complement of planes will be available for these ships if ever they are called upon for active service.—*Naval and Military Record,* 19 July, 1922.

Reconstruction of H.M.S. *Furious*

Hitherto the chief drawback to the use of planes as torpedo-carriers has been the tendency of the torpedo, when dropped into the water, to

break up or suffer machinery derangement that causes it to sink or run erratically. It is understood, however, that this defect has been largely overcome by evolving a special type of torpedo for the work in question. and there are rumors that a practical display of the powers of the new arm will take place during the King's visit to the Atlantic fleet this week. Another proof of the admiralty's continued interest in the naval side of aviation is the extensive overhaul which the *Furious* is now undergoing at Plymouth the cost of which will be upwards of £300,000. While the details of her reconstruction must be regarded as confidential for the time being, they are known to be of such a nature as will materially increase the value of the ship as a floating aerodrome, capable of taking to sea at high speed a large number of aeroplanes, including torpedo carriers, and affording them ample deck space both for flying-off and landing.

In her new guise the *Furious*, it is anticipated, will be the finest aircraft-carrier in the British navy, and will only be surpassed for speed and capacity by the huge battle cruisers which the United States and Japan are now converting on the same lines. Had the financial situation permitted, the admiralty would no doubt have preferred to build one or more absolutely new ships as tenders to air craft, since naval opinion is opposed to reconstruction on principle, and earlier attempts to adapt existing ships as aircraft carriers have not always been successful. In the prevailing circumstances, however, it would be impossible to obtain the funds necessary for laying down new large carriers of special design, so that the decision to spend £300,000 on modernizing the *Furious* is probably justified.—*Naval and Military Record*, 5 July, 1922.

New Capital Ships

Lord Lee of Fareham, first lord of the admiralty, made an important statement in the House of Lord's yesterday week, in the course of which he explained the government's attitude with regard to the two new capital ships, the construction of which is authorized under the Washington Treaty.

Replying to the Marquis of Linlithgow, the first lord remarked that he had been aware of the rumors in the press that the government either had or was about to execute a volte-face with regard to the building of the two capital ships sanctioned by the Washington Naval Treaty. The government had not reconsidered its decision, nor did it intend to do so. He preferred on the whole not to go in any detail into the technical question of what aircraft were or were not capable of in attack upon service vessels. He did not want to say anything which would in any way suggest—because it would be false—lack of sympathy on the part of the admiralty to the air force or to its continued development. There was no portion of the fighting services which was more interested in the development of aircraft than the Royal navy. It was a vital weapon of the fleet, and must be developed and made use of to the utmost possible extent. There had been no new developments in connection with either aerial or under-water attack which necessitated any reversal of the decision to proceed with the capital ships, or any modification in the constructional designs already approved. The admiralty believed it was feasible to build capital ships which should be reasonably proof against any known or, so far as one could forsee, any likely methods of attack. Designs for that purpose had already been worked out, and were ready for the builders' use.

The present relative position was that the United States had three post-Jutland capital ships completed, Japan had two actually completed, and Great Britain had only one hybrid battle cruiser. It was partly constructed before Jutland, and only partially embodied the lessons of

that battle. Other countries had none. Unless these two new capital ships, which had already been approved by parliament, were proceeded with, we should have to abandon the one-power standard, and should have to fall to third place in the most essential fighting spearhead of the fleet, which, of course, would be fatal to our prestige throughout the world, and a position which the board of admiralty could not possibly accept. He expressed surprise that the campaign against capital ships should be pursued in any responsible or instructed quarter, seeing that the whole question had been gone into thoroughly and exhaustively last year by a special committee of the Committee of Imperial Defence, presided over by Mr. Bonar Law. That committee reported that they had heard no evidence adequate to support the contention that the capital ship was obsolete, and that in naval warfare of the future the view must be accepted that these ships would play the same vital part they had done in the past. That finding coincided with the findings in other countries.

Sir Percy Scott, who was now leading the agitation against these ships, refused to attend the sittings and declined to give the committee any assistance whatever. This, coupled with the fact that he had not had the advantage of serving in a capital ship for more than thirty years, somewhat diminished the force and responsibility of his utterances. On the whole, he preferred to lean on the advice of the great sailors, headed by Lord Beatty, who actually commanded the fleets throughout the late war, and who were unanimous in the advice which they gave to the admiralty and the government that capital ships would continue to be an absolute essential and vital factor in the future.

The matter then dropped.—*Naval and Military Record,* 19 July, 1922.

PURPOSE OF BRITAIN'S TOWERS IS DISCLOSED.—London, July 12.—Mystery surrounding the huge concrete towers built by the admiralty just before the armistice was cleared up when Lieutenant-Commander Kenworthy, during debate at the Commons, explained that they were new anti-submarine weapons.

Toward the end of the war the admiralty completed two tremendous concrete structures, much like disproportionate pill boxes, weighing thousands of tons, at Channel ports. Ten other towers were under construction when the armistice was signed. Work was slowed on them, but finishing touches were put upon the completed towers.

During the submarine campaign it was vitally necessary to keep open the Straits of Dover, the main channel for troops and munitions from England to France. The admiralty invented the towers to combat the submarines. They were to be towed to sandbanks along the straits and sunk. They would have been occupied by the anti-submarine crews, where, reinforced by steel, they would have become island forts.

The towers, the admiralty thought, would provide much more efficient weapons than patrol boats, which were forced to seek shelter during rough weather. On the towers would have been mounted searchlights and guns, which would have swept the channel for miles around.

In addition, there would have been apparatus for the detection of submerged submarines by sound, and there would have been "keys" for exploding minefields through which the passage of submarines was suspected or established.—*Baltimore Evening Sun,* 13 July, 1922.

Admiralty (Naval Staff)*

GENERAL DISTRIBUTION OF NAVAL STAFF DUTIES

FIRST SEA LORD AND CHIEF OF NAVAL STAFF

All large questions of naval policy and maritime warfare. Organization, distribution, and fighting and sea-going efficiency of the fleet.

Advice as to, and general direction of, operations of war.

Internal organization and general direction of the work of the naval staff, and the co-operation of the naval staff with the material side of the admiralty.

(To be kept informed of all important matters by the D. C. N. S. and A. C. N. S.)

DEPUTY CHIEF OF NAVAL STAFF (D. C. N. S.)

Naval Intelligence—its collection and utilization for naval operations; and superintendence of naval intelligence division.

Principles of training of the navy in combatant and staff duties, and superintendence of training and staff duties division.

All operations and movements of H. M. ships and co-operating aircraft, including auxiliary craft.

Consideration of strategic policy, and plans relating to such operations.

Distribution of the fleet as affecting operations and movements.

Dates of refits and repairs (in conjunction with controller).

Strategic aspect of land and wireless telegraphy.

Policy in relation to sea-borne trade and maritime transport.

Maritime international law.

ASSISTANT CHIEF OF NAVAL STAFF (A. C. N. S.)*

Methods of fighting at sea generally. Tactical investigation.

Requirements of design of vessels and material in relation to policy and tactics.

Signalling in connection with tactics and weapons.

Fleet practices, co-ordination and standardization of methods.

Staff questions dealing with research and experiment.

Air development in relation to naval warfare.

DIVISIONS WORKING UNDER THE DEPUTY CHIEF OF NAVAL STAFF

1. *Naval Intelligence Division*

Collection of naval intelligence.

Distribution of intelligence to the fleet and to all naval establishments.

Information as to the movements of British and foreign ships (movements section).

Supervision of naval attaches.

Censorship, aliens, passports, safe conducts, suspected persons, prisoners of war.

Regulation of confidential books.

*NOTE

H.M. STATIONERY OFFICE,
PRINCES STREET,
WESTMINSTER, S.W.1.

C.5.16.1a. 29 May, 1922.

Sir,

I am directed by the Controller to acknowledge the receipt of your letter of the 9th instant and to acquaint you that no objection will be taken to your reproducing, in the U. S. NAVAL INSTITUTE PROCEEDINGS, the Report on the Distribution of duties of the Naval Staff (Cmd. 1343), provided that the source from which the reproduction is taken be duly acknowledged, and that mention be made of the fact that the permission of the Controller of His Majesty's Stationery Office has been obtained.

I am, Sir,
Your Obedient Servant.

L. G. Scorgie,
Deputy Controller.

The Secretary and Treasurer,
U. S. Naval Institute,
Annapolis,
MD.

2. *Training and Staff Duties Division*

Organization of staffs ashore and afloat.

Co-ordination between the naval staff and other admiralty departments.

Recommendations of officers for appointment to staffs.

Staff course and senior officers' courses.

Principles governing entry and training of officers and men.

Co-ordination of training.

Compilation of manuals dealing with strategical principles or staff training.

Co-ordination of all training manuals.

Preparation of historical monographs.

3. *Plans Division*

Methods of naval warfare in general in so far as they affect policy and strategy.

General plans for future wars.

Types and numbers of ships, quantity and distribution of material affecting the above.

Plans for fleet maneuvers.

Strategical co-operation with the army and air force.

Plans division will be kept entirely free from all executive work and routine work.

4. *Operations Division*

Operations, movements, and distribution of the fleet; preparation of orders dealing therewith, and issue of such orders, other than those despatched by letter.

Preparation of detailed plans for operations.

Letters of proceedings from commanders-in-chief, and of H. M. ships.

Advice on all questions which affect operations, movements and distribution of the fleet.

Keep movements section informed of distribution and movements of British forces, other than those dealt with by local defence division.

5. *Local Defence Division*

Defence of harbors and bases.

Patrol and minesweeping forces.

Fishing fleets.

Liaison with war office, air ministry, and other government departments on defence matters. Director of L. D. D. is a member of the home ports defence committee and overseas defence committee.

Defence schemes. Instructions for entry into defended ports.

Mine warnings.

Keep movements section informed of distribution and movements of local defence forces.

6. *Trade Division*

Trade division is the connecting link with the mercantile marine and the economic departments of the government.

Defence of British trade, which includes:

- Convoy, diversion of shipping, routing and war instructions to mercantile marine.
- Information in regard to British shipping.
- Defensive equipment of British merchant vessels and provision and training of personnel therefor.

Attack on trade, which includes:

- Blockade, contraband, and control of trade, enemy and neutral.

Questions of foreign policy, international law, and treaties, so far as they relate to above.
Prizes and prize court matters.

DIVISIONS WORKING UNDER THE ASSISTANT CHIEF OF NAVAL STAFF

7. *Gunnery Division*

Gunnery and chemical warfare policy.

Co-ordination and standardization in the methods of using weapons connected with the above, and training in such weapons.

Advice on material in connection with above so far as tactical requirements and policy are concerned.

Scrutiny of reports of gunnery practices, and advice on co-ordination of such practices.

Air co-operation in gunnery matters.

Recommendations regarding type and allocation of targets.

8. *Torpedo Division*

Torpedo, mining, anti-mining, and anti-submarine policy.

Co-ordination and standardization in the methods of using weapons connected with the above, and training in such weapons.

Advice on material in connection with the above so far as tactical requirements and policy are concerned.

Scrutiny of reports of torpedo, mining and anti-mining practices, and advice on co-ordination of such practices.

Air co-operation in torpedo, mining, anti-mining, and anti-submarine matters.

Advice on the tactical requirements of coastal motor boats, distant control boats, and torpedo planes.

9. *Tactical Section*

Assists A. C. N. S. with tactical problems and signalling in connection therewith, and with fighting instructions. Compilation of tactical manuals.

10. *Air Section*

Assists A. C. N. S. with air questions relating to naval warfare.

Co-ordination of all air matters dealt with by the naval staff.

Provides information on air matters required by any branch of the naval staff.

APPENDIX

DETAILED INSTRUCTIONS FOR NAVAL STAFF DIVISIONS

The Operations Committee consists of the following members of the board:

The first lord (*ex-officio* chairman).
The first sea lord and chief of naval staff.
The deputy chief of naval staff.
The assistant chief of naval staff.

It deals with questions of naval strategy and subjects connected with the provision, training, equipment, efficiency, organization, and utilization of the navy as a fighting force, and meets periodically as necessary.

2. The naval staff working under the operations committee is organized as shown in the diagram on page 8 (see page 1563), and consists of the following divisions:

Naval intelligence division.
Plans division.
Training and staff duties division.
Trade division.
Operations division.

Local defense division.
Gunnery division.
Torpedo division.

The superintending lords (D. C. N. S. and A. C. N. S.), to whom the superintendence of the several divisions of the staff is assigned, are primarily responsible for the efficient working of those divisions. This does not, however, preclude the C. N. S. from dealing direct with a division if necessary, nor the D. C. N. S. and A. C. N. S. from dealing direct with divisions not under their immediate superintendence. Divisions are enjoined to refer freely to other divisions, where the matter in hand requires such consultation.

Under the C. N. S., the D. C. N. S. is particularly concerned with strategy, policy, general principles of training and the conduct of operations, and superintends the six divisions standing first in the above list. The A. C. N. S. is particularly concerned with questions of tactics and fighting efficiency, the development of weapons and training in the use thereof, and all questions of naval co-operation with air forces; he superintends the gunnery and torpedo divisions, and is assisted by the tactical and air sections.

3. Staff meetings, attended by all directors of divisions under the presidency of one of the superintending lords, are held periodically. Directors of divisions may be accompanied by heads of sections of their divisions when necessary.

4. In order to avoid overlapping and duplication of work, each division must at all times communicate freely with all other divisions concerned with the matter in hand, care being taken that none interested is omitted. Close touch with plans division must be maintained by all other divisions so that action taken by them may be consonant with approved plans for possible hostilities or for future types of ships and material, and with naval intelligence division to ensure that they are in possession of the latest intelligence bearing on the matter in hand.

Inter-divisional minuting should always be avoided when verbal communication can replace it, joint minutes being prepared when matters concern more than one division. Separate minutes should be limited as far as possible to cases in which agreement cannot be reached, and it is then the duty of the division last dealing with a question to submit it for decision before it leaves the naval staff.

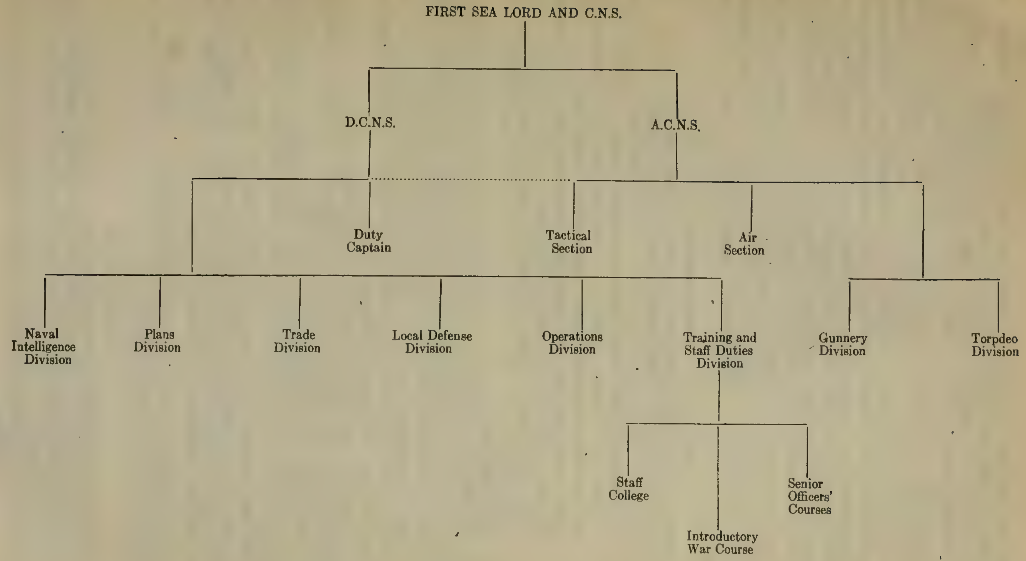
5. In the same way, close touch must be maintained by all divisions of the staff with the technical and supply departments that translate principles approved into action, in order that the policy recommended may be compatible with material development, and that the direction of development may be guided by the requirements of policy.

6. Directors of divisions are authorized to act without further approval of superintending lords in cases where the principle had already been approved, but it is their duty to keep the superintending lords informed as requisite of such action taken by them.

7. The deputy director of each division will perform such specific duties as are allotted to him by the director, but is to keep himself sufficiently conversant with the whole work of the division to replace the director in his absence. He should relieve the director of all matters of detail and routine as far as possible.

Where the expansion of the staff on the outbreak of war would involve the enlargement of one division into two separate divisions, the deputy director would, naturally, assume the position of director of one of them, and his duties should be arranged accordingly.

8. Instructions for each division follow, and the outline of the organization of each has been fixed. Subject to these, the internal organization of each division is the province of the director, but no large departures


FIRST SEA LORD AND C.N.S.
D.C.N.S.
A.C.N.S.
Duty Captain
Tactical Section
Air Section
Naval Intelligence Division
Plans Division
Trade Division
Local Defense Division
Operations Division
Training and Staff Duties Division
Gunnery Division
Torpdeo Division
Staff College
Introductory War Course
Senior Officers' Courses

from the approved form of organization can be initiated without the authority of the superintending lord and chief of naval staff.

The director of training and staff duties should always be consulted if any internal change affects relations with other divisions or departments.

9. In order to ensure that no division shall deal with matters properly in the province of another division, copies of the foregoing instructions are to be hung up in all rooms occupied by the naval staff, together with those for the particular division occupying each room. The attention of all divisions is drawn to the functions discharged by the movements section defined in paragraph 13 of instructions for the naval intelligence division. Care must be taken that this work is not duplicated in any division, and all enquiries on matters dealt with by the movements section are to be addressed to it, and not to other divisions.

10. Directors are to arrange that there shall be a duty officer for each division, and that in order that he shall be accessible at all times the address and telephone number of this officer, before he leaves office at the end of ordinary working hours, shall be given to the duty captain daily.

Duty Captains

The three duty captains work under the orders of the D. C. N. S., and one of them is to be constantly on duty day and night.

2. Copies of all messages received or sent by the war registry which affect the naval staff will be delivered to the duty captain.

(N.B.—The war registry receives all messages and is responsible that they are sent to the officers or departments whose dutv it is to take action upon them, or who should be acquainted with their contents. The duty captain will correct, if necessary, the distribution made by the war registry and is responsible that all immediate questions reach the C. N. S., D. C. N. S., or A. C. N. S., or division of the staff concerned.)

3. During silent hours, or in the absence of the C. N. S., D. C. N. S., or A. C. N. S., the duty captain is their representative, and he will exercise his discretion as to whether he deals himself with any immediate matter that occurs, or informs them of it, by telephone or messenger.

4. As representative of the C. N. S., D. C. N. S., or A. C. N. S., the duty captain will attend personally to telephone communications intended for them during silent hours.

5. The duty captain will work in close co-operation with naval intelligence, operations, and local defence divisions in matters of telegraphic communications with which they are concerned.

6. The name and address of a duty officer for each division of the naval staff will be communicated to the duty captain by directors of divisions.

The duty captain is to arrange that the heads of such offices as the naval inter-allied commission, etc., which partake of the nature of staff divisions, are supplied with a copy of article 10 of instructions to the naval staff and requested to conform thereto.

NOTE.—The question of the permanent retention of Duty Captains as part of the post-war organization of the naval staff will be considered at a later date when conditions have become more normal.

Tactical Section

The duties of the tactical section under the A. C. N. S. will be:

(a) To keep in close touch with the tactical problems under consideration in the various fleets, and to co-ordinate their work.

(b) To watch the theoretical tactical studies of the war and staff colleges.

(c) To advise as to information to be given to commanders-in-chief afloat upon those problems in regard to which the naval staff consider practical investigation is required.

(d) To compile the tactical manuals, and keep them up to date with the progress made.

2. The tactical section will also assist the A. C. N. S. in the consideration of:

Fighting instructions.

Tactics and maneuvers, as affected by weapons in use, and signalling in connection therewith.

3. The tactical section will maintain close touch with the gunnery and torpedo divisions respecting signal requirements of weapons in use or proposed, and with the director of signal department respecting technical signal questions.

4. Paragraph 3 of the instructions for plans division is to be conformed with.

Naval Air Section

1 The naval air section assists the A. C. N. S. in the consideration of all air questions relating to naval warfare. Its functions are:

(a) To deal in the first instance with all air information and reports, and co-ordinate all air matters dealt with by the naval staff.

(b) To advise generally on the naval side of questions of fleet air warfare.

NOTE.—Advice on the air side is the province of the air ministry.

(c) To keep in close touch with air progress.

(d) To assist by information or in any other way required any branch of the naval staff that is concerned with the air weapon.

2. The naval air section will maintain touch, through the liaison officer especially attached for the purpose to the air officer commanding coastal area, with the various branches of the air staff which deal with the air side of fleet air warfare, and, as necessary, with the technical branches of the air ministry which deal with material.

3. Paragraph 3 of the instructions for plans division is to be conformed with.

Naval Intelligence Division

The naval intelligence division is responsible for the collection of all home and foreign intelligence of naval interest; for its collation and record; and for issuing it, in the form suitable to their requirements, to other divisions of the naval staff and admiralty departments, together with remarks and criticisms, and, where necessary, an outline of the courses of action that arise therefrom, or recommendations as to the policy to be adopted (*see* note to paragraph 2).

The naval intelligence division is further responsible for the distribution of such intelligence to commanders-in-chief, senior naval officers afloat and at bases, and to ships at sea.

2. The director of naval intelligence will submit suggestions at his discretion on all questions of naval policy (including general foreign or imperial policy) arising out of information received in the naval intelligence division.

NOTE.—All papers on which courses of action or recommendations as to policy are made should be referred to director of plans in order to facilitate coordination of the policy suggested with the policy on which strategic requirements are based, or on which war plans are drawn up. In the case of telegrams or other urgent papers received in N.I.D., in which policy is involved, the D.N.I. may be required to submit recommendations or advice as to policy to be adopted direct to D.C.N.S. or C.N.S. In these cases, copies of such recommendations are always to be sent to director of plans for information.

3. The D. N. I. will keep in close touch with the D. O. D. with respect to projected movements of British forces which concern relations with foreign powers, and similarly, with respect to matters affecting relations with foreign powers that may have a reaction on projected movements of British forces.

4. He will supervise the organization of the naval intelligence system throughout the world, and is responsible for preparing and issuing instructions and publications dealing therewith.

5. He will supervise the work of naval attachés, corresponding direct with them, and dealing with their reports.

6. He is also authorized to communicate direct on naval intelligence matters with the following:

Home, foreign, war, air, colonial and India offices; Officers in charge of naval intelligence offices in U. K., naval intelligence officers and naval consuls abroad. Other local officials as necessary.

7. He will be responsible for all forms of special intelligence, and will prepare and keep up to date the organization necessary to ensure immediate operation on the outbreak of war, maintaining the necessary nucleus staff.

8. He will deal with or advise upon all questions of naval censorship, including those of such press articles and publications as are submitted for approval before publication, and those of admission of press correspondents to H. M. ships and naval establishments, and all matters affecting the press generally on naval subjects.

9. He will, as far as naval interests are concerned, deal with or advise upon the following matters, such as in time of war are covered by the Defence of the Realm act:

Aliens,
Passports,
Safe conducts,
Suspected Persons,
Prisoners of war.

10. He is responsible for the following duties in connection with confidential and other books for the naval service:

(a) Classification of printed books for the fleet, giving effect to the principle that the "C. B." series shall contain only secret and confidential matter.
(b) Advice to the compilers on the contents of authorized books in course of preparation, in order that confidential and non-confidential matter may be issued in separate publications, that overlapping may be prevented, and that the issue of confidential books may be reduced as far as possible.
(c) Recommendations for re-classification of any books as soon as the necessity for their secrecy ceases.
(d) Regulation of the establishment of confidential books for sea service, ships in reserve and naval establishments, as advised by the heads of branches producing books, with a view to limiting the issue to each class of ship to what is actually necessary at the time.
(e) Regulation of the distribution of books (except cyphers).
(f) In consultation with the division or department compiling each book, regulation of the number of copies to be printed, having regard to the period the book is likely to run before revision, its secrecy and stowage, and the cost of production.

11. To enable him to carry out the duties defined in 10 (*b*), (*c*), and (*f*), heads of divisions and departments, previous to the preparation of any new books or the revision of existing books, should instruct those

responsible for the production to confer with D. N. I. on the points mentioned; to keep him fully informed of the reasons for keeping the books confidential or secret; in order to prevent overlapping to supply him with a précis of the scope, nature, and details of the book in question; and to comply with the requirements stated in paragraph 10 (*b*) above.

When proposals for new books, or revisions of existing books, are put forward to the board, the papers initiating the proposals should be marked to D. N. I. for information before submission to the board.

12. He will supervise the staff library at the admiralty.

13. He will provide the officer in charge of, and will generally supervise, the movements section (I. D. 20). An officer from operations division and clerical staff belonging to intelligence division, operations division, and the military branch of the secretary's department work in this section, and in it are concentrated all records of movements or units dealt with by them.

The function of the movements section is to analyze, record, and promulgate as necessary inside the admiralty all information relating to movements of British and foreign war vessels (including British auxiliary patrol vessels and fleet auxiliaries), and to supply the G. P. O. with mail addresses of H. M. ships. Movements of war vessels are also recorded on wall charts.

NOTE.—Programs of movements etc., which are ordered to be notified to the whole office, are issued by the secretary (military branch) in the ordinary way.

Plans Division

1. The plans division will advise on all large questions of naval policy and maritime warfare.

2. Its functions will be the consideration of:

(*a*) Methods of naval warfare in general, in so far as they affect policy and strategy.

(*b*) The recommendation and revision of general plans for future wars as distinguished from detailed plans of operations which are a function of operations division.

(*c*) Questions of general imperial policy and of the policy of nations allied, or possibly allied, in relation to (*b*).

(*d*) General strategical questions, such as development of naval bases and communications, the attack and defence of commerce and the state and disposition of the fleet.

(*e*) Questions of strategical co-operation with the army and air force.

(*f*) Questions of international law in so far as it is concerned with imperial strategy and naval policy.

(*g*) Types and numbers of ships, submarines, aircraft, etc., and quantity and distribution of material, required by strategy or policy.

(*h*) Combined operations, in consultation with imperial general staff and air staff, their scale and general lines of organization. Types and numbers of ships, auxiliaries, and material connected therewith.

(*k*) Questions of fleet numbers in relation to admiralty policy.

(*l*) New scientific developments from strategical point of view.

(*m*) General plans for fleet maneuvers.

3. The director of plans or his representative will attend meetings held to discuss new designs of vessels or aircraft, or large alterations of existing designs, to advise on strategical requirements. Proposals for new types of ships or aircraft are to be referred to him for examination before detailed designs are prepared, or, in the case of "repeat" orders, before orders are placed.

4. Suggestions involving new operations or employment of new weapons, appliances, or material, shall be referred to director of plans for information and opinion on their strategical aspect.

5. The director of plans will keep the director of signal department sufficiently informed of the work of plans division to enable the latter to ensure that the signal organization keeps pace with strategical requirements.

6. Plans division will be kept entirely free from all executive or routine work.

Training and Staff Duties Division

The director of training and staff duties division will advise on the following matters:

(*a*) Organization of the admiralty naval staff and co-ordination of divisions of the staff.
(*b*) Co-ordination and relationship of the staff with other branches of the admiralty.
(*c*) Principles of staff organization and definition of duties of officers of staffs, ashore and afloat.
(*d*) Establishment of staffs.
(e) All questions of staff qualifications.
(*f*) Recommendations of officers to qualify for staff duties, and for appointments on the admiralty naval staff and corresponding appointments on the staffs of flag officers ashore and afloat.
(*g*) Principles governing systems of entry of officers and men.
(*h*) General principles governing general and technical education and training of officers and cadets, men and boys, and co-ordination of schemes of education and training with one another in accordance with those principles.

2. He will be responsible for schemes of training and instruction in the staff college and senior officers' courses and introductory war course, and will advise upon governing principles, subject matter to be included, and general methods of instruction to be adopted.

3. He will be responsible for:

(*a*) Preparation of all manuals and text books dealing with staff duties and staff training, and of historical monographs dealing with operations or required by the staff college.
(*b*) Compilation, in co-operation with the fleet and other divisions of the naval staff, of all manuals dealing with strategical principles.
(*c*) Consideration from a co-ordinating point of view and final submission for approval of all manuals dealing with general training, or training in special branches, prepared by other divisions of the naval staff or technical departments.
(*d*) Advice from a co-ordinating point of view on text books upon technical subjects, so far as these involve the treatment of strategical principles, and reference of such text books to tactical section if they touch upon tactical principles.
(*e*) Advice as to what books are to be included in officers' libraries.

4. Inasmuch as the activities of the D. T. S. D. will very generally concern the second sea lord as well as other members of the board, it is essential that the closest inter-communication should be maintained, and that they should be consulted on matters that concern them.

5. In the performance of his duties he will, when required by the C. N. S., visit commands, or make enquiry into any matters upon which information is needed.

Trade Division

The trade division is the connecting link between the admiralty and:

(a) The mercantile marine, in matters concerning defence of British seaborne trade and self-defence of shipping engaged therein.

(*b*) The political and economic departments of the government, in matters concerning offensive action against potential enemy trade; and maintenance of British seaborne trade, as far as the latter concerns the protection of British shipping.

2. For the purpose of (*a*), the director of trade division will keep in close touch with the board of trade (marine department), ministry of transport, customs, and other departments concerned: Lloyds, shipping associations, and kindred bodies.

For the purpose of (*b*), he will keep in close touch with the foreign office, board of trade, department of overseas trade and other departments concerned.

3. He will be responsible for the preparation, and revision as required, of plans for:

Convoys.
Diversion of shipping.
Routes for independent sailings.
War instructions for mercantile marine on these subjects.

He will keep in close touch with the directors of plans, operations, and local defence divisions, and the director of transports and shipping in this connection.

4. For the purpose of the above, he will collect and keep the necessary information and statistics relating to:

British shipping on various routes.
Facilities for fuelling and repairing ships.
Facilities for handling cargo (in case of diversion) throughout the world, obtaining intelligence on these matters from the authorities referred to in paragraph 2, and by means of a liaison section working with the naval intelligence division.

5. He will prepare and keep up to date plans for:
Arming and equipment of British merchant vessels in time of war.
Provision and training of personnel therefor.

War and technical instructions to mercantile marine on these subjects; keeping in close touch with the technical and supply departments with respects to provision of material; with gunnery and torpedo divisions with respect to technical progress; with admiral commanding reserves and second sea lord's department with respect to personnel; and with the director of transports and shipping regarding the selection of ships to be taken as convoy escort vessels.

He will advise on questions of claims from and allowances to ship-owners on these matters.

6. He will advise upon the use of rescue tugs in war.

7. He will advise on all matters of blockade, contraband, and the control of trade, enemy and neutral, and on questions of foreign policy, international law and treaties as far as they relate to matters of blockade, contraband. and control of trade. For this purpose he will collect for all maritime countries information and statistics relating to oversea sources of supply of:

Staple food stuffs;
Raw materials essential to economic life;
Commodities likely to be of military value in war;

obtaining intelligence on these matters from the authorities referred to in paragraph 2 and by means of a liaison section working with the naval intelligence division.

8. He will keep in close touch with the director of plans division in all these matters.

The Operations Division

The operations division will deal with all matters relating to the operations, movements, and distribution of the fleet.

2. The director of operations division will arrange to keep, in the movements section (*vide* paragraph 13 of instructions for naval intelligence division), complete records of the distribution and movements of all British forces other than those dealt with by local defence division. He will keep the operations committee of the board fully informed of the current situation, and will prepare such summaries and appreciations as are required by them, drawing the necessary information from intelligence, trade, and other division when concerned.

3. He will assist as required in the preparation of orders dealing with operations, movements, and distribution of the fleet; and, in consultation with the director of signal department regarding methods and routes of messages, will issue to the fleet those despatched otherwise than by letter.

4. He is responsible for the preparation of sailing orders issued from the admiralty to H. M. ships, including those not in commission when moved by sea. He will, when requested by the various departments controlling the movements of fleet auxiliaries and vessels on government charter, co-operate with them in the preparation of sailing orders for such vessels.

5. He will prepare and keep up to date detailed plans of operations in accordance with the general policy laid down by C. N. S.

6. He will advise on the following matters from the point of view of their effect on operations, movements, and distribution of the fleet:

Commissioning, trials, and refits of H. M. ships.
Mining.
Fishing areas; restrictions, etc.
Navigation and pilotage.
Transport and trade.
Communication questions (*see* paragraph 12).
Supply of stores, ammunition, and fuel to the fleet, and instructions for taking up mercantile fleet auxiliaries.
International law, questions relating to hospital ships and cartel ships.

7. Letters of proceedings from commanders-in-chief and of H. M. ships will be referred to D. O. D., who will be responsible for initiating the necessary action upon them so far as they affect matters dealt with by the division.

8. The following are also to be referred to the D. O. D.:

Political questions (foreign or home) affecting the fleet.
Correspondence with other departments of state relating to such questions.
Reports of courts-martial, courts of enquiry, and other disciplinary reports which relate wholly or in part to operations and movements.

9. The D. O. D. will keep in close touch with the D. N. I. with respect to movements of British forces that concern relations with foreign powers, and will co-operate with him in the working of the movements section, as laid down in paragraph 13 of instructions for intelligence division.

10. He will keep in close touch with hydrographer with respect to maintenance of charts and other hydrographic publications required for the use of the naval staff (staff information chart room).

11. He will be responsible for the preparation and revision of publications and returns falling within his province.

12. He will keep the director of signal department sufficiently informed on current operations to enable the latter to ensure that the signal organization keeps pace with operational requirements.

Local Defence Division

1. The director of local defence division will advise as to the organization and employment of patrol and minesweeping forces throughout the world; as to the passive defence of harbors and bases; and on defence matters generally.

2. In accordance with the general policy approved by C. N. S. he will prepare detailed plans:

(*a*) For the organization and employment of patrol and minesweeping forces,* control and grouping of fishing fleets; and

(*b*) Relating to passive defence of harbors and bases against attack by sea, and, so far as navy is concerned, by air or land.

He will keep them up to date in accordance with the current state of resources and progress, technical and personal.

He will keep in close touch with plans division in this connection.

* NOTE.—These comprise the following craft, except when attached to sea-going forces: all minesweeping and boom defence craft; that employed on purely anti-submarine duties, *i. e.*, hunting flotillas; those attached to auxiliary patrol squadron, including fishery protection craft; those attached to bases for local defence duties; and those detailed for mine-laying in defence of harbors.

3. He will advise as to bringing these plans into force, and as to allocation distribution, and employment of forces involved. He will assist as required in the preparation of orders dealing with those matters and, in consultation with the director of signal department regarding methods and routes of signals, will issue those despatched otherwise than by letter.

4. He will supply the movements section (*vide* paragraph 13 of instructions for naval intelligence division) with the information in his possession respecting movements of the vessels detailed in note to paragraph 2, necessary for the records kept by that section.

5. He will keep in close touch with the operations division with respect to plans for fleet sweeping.

6. He will keep in close touch with the naval air headquarters so as to ensure co-ordination of air patrols with naval patrols, anti-submarine and minesweeping forces.

7. He will keep in close touch with the trade division, in order to co-ordinate plans for minesweeping on outbreak of war with those for control of mercantile movements.

8. As a member of the home ports defence committee and overseas defence committee he will keep in touch, as regards defence matters, with the war office, air ministry, colonial and India offices, and other government departments.

9. He will maintain close touch with the torpedo division and gunnery division in order to co-ordinate plans for the employment of the forces referred to in paragraph 2 with technical progress and requirements of training, and to obtain any technical assistance required in connection with defence schemes.

10. He is responsible for revision of defence schemes, defence charts, instructions for entry into defended ports, and other similar books of instructions concerning defence matters.

11. He is responsible for the organization for the issue of mine warnings in conjunction with the director of signal department, and he will keep the latter sufficiently informed on the work of the local defence division to enable him to ensure that the signal organization keeps pace with operational requirements.

Gunnery Division

1. The director of the gunnery division (D. of G. D.) will advise on:
   - (*a*) Practical gunnery and gunnery exercises.
   - (*b*) The use of gas and smoke in warfare and counter-measures.
   - (*c*) The methods of instruction in the training establishments for carrying out training in the use of:
     - (*i*) Gunnery weapons,
     - (*ii*) Smoke, gas, anti-gas apparatus.

He is responsible for keeping the naval staff in touch with progress and general development of the fleet in gunnery and chemial warfare and with the method of conducting gunnery and chemical warfare practices at sea.

2. He will advise on:
   - (*a*) Gunnery policy, both offensive and defensive as affecting design.
   - (*b*) Quantity and distribution of gunnery material so far as tactical requirements are concerned.
   - (*c*) Effect on gunnery policy of technical development and scientific research and progress.
   - (*d*) Air co-operation in gunnery matters.

NOTE.—Technical advice on the design of gunnery material, chemical warfare material, and material for counter-measures is the function of the director of naval ordnance.

3. He is responsible for scrutinizing all reports of gunnery practices submitted to the admiralty for review by commanders-in-chief and senior officers, and will advise as to the action necessary:
   - (*a*) To control the lines on which the various commands are working, and to co-ordinate their work.
   - (*b*) To keep each command in touch with the progress made by others.
   - (*c*) To standardize methods.

4. In matters of material arising from reports of practices, he is responsible for co-ordinating suggestions from various commands and for advising on them from the point of view of practical use and training, before they are dealt with by the appropriate department under the controller.

5. He is responsible for the compilation of records and summaries of fleet gunnery practices, and for the preparation and periodical revision of the firing manual and any other handbook relating to his duties. He is responsible that these embody all general orders for carrying out practices necessary for the acquisition and maintenance of efficiency, and all lessons learned from action experience and peace practices.

NOTE.—The responsibility for progress and development in gunnery matters in the fleets under their command rests entirely with the various commanders-in-chief.

6. In conjunction with the director of training and staff duties, who is responsible for advice on general policy and principles of training, he is responsible to the A. C. N. S. for the formulation of requirements of technical gunnery training.

7. He is responsible to the A. C. N. S. for advice on training in the use of gunnery weapons, smoke, gas and counter-measures carried out at the training establishments.

8. With regard to paragraph 6 and 7, he will keep in close touch with the director of naval ordnance, who is responsible to the second sea lord for advice on complements and quarter bills, training in so far as it affects safe working and maintenance of material, and training in diving, and who is responsible to the controller for advice on material.

NOTE.—The D. of G.D. is concerned with the use of weapons whilst the D.N.O. is concerned with their preparation for use. These respective spheres of activity meet in the drill which is required to prepare finally the weapon for use. Drill, having the double purpose of producing the best result from the weapon and also of preventing damage or accident due to improper handling of material, is common ground to both the D. of G.D. and D.N.O., to whom it is a joint responsibility. Whilst therefore close co-operation between the D. of G.D. and D.N.O. is always necessary, it is especially so in the domain of drill.

9. He will be responsible for recommending the type and the allocation of targets to meet the requirements of the fleet.

NOTE.—Designs, repairs, and provision of targets are administered by the controller's department.

10. He will at all times maintain close touch with the director of torpedo division respecting suggestions for the employment of new weapons, and with director of plans respecting the strategical aspect of all questions referred to him.

11. He will be at liberty to communicate directly with the commanding officers of the gunnery schools on all questions of training in the use of weapons lying in his sphere as defined by these instructions.

12. He will conform with paragraph 3 of the instructions for plans division.

Torpedo Division

1. The director of torpedo division (D. of T. D.) will advise on:
   (*a*) The practical use of and exercise with torpedoes, mines, anti-mine devices, anti-submarine weapons and methods.
   (*b*) The methods of instruction in the torpedo, mining, and anti-submarine schools for carrying out training in the use of weapons.
   (*c*) The tactical requirements of coastal motor boats, distant control boats and torpedo planes.

He is responsible for keeping the naval staff in touch with the progress and general development of the fleet in the use of these weapons, and with the methods of conducting exercises therein at sea.

2. He will advise on:
   (*a*) Torpedo, mining, anti-mining, and anti-submarine policy, both offensive and defensive as affecting design.
   (*b*) Quantity and distribution of material concerned in the above so far as tactical requirements are concerned.
   (*c*) Effect on that policy of technical development and scientific research and progress.
   (*d*) Air co-operation in torpedo, mining, anti-mining and anti-submarine matters.

NOTE.—Technical advice on torpedo, mining and anti-submarine material matters is the function of the director of torpedoes and mining.

3. He is responsible for scrutinizing all reports of torpedo, mining, and anti-submarine practices submitted to the admiralty for review by commanders-in-chief and senior officers and will advise as to the action necessary:

(*a*) To control the lines on which the various commands are working, and to co-ordinate their work.
(*b*) To keep each command in touch with the progress made by others.
(*c*) To standardize methods.

4. In matters of material arising from reports of practices he is responsible for co-ordinating suggestions from various commands, and for advising on them from the point of view of practical use and training, before they are dealt with by the appropriate department under the controller.

5. He is responsible for the compilation of records and summaries of fleet torpedo, mining and anti-submarine practices, for the preparation and periodical revision of *Regulations for Practice Running* and any other handbook relating to his duties. He is responsible that these embody all general orders for carrying out practices necessary for the acquisition and maintenance of efficiency, and all lessons learned from action experience and peace practices.

NOTE.—The responsibility for progress and development in torpedo, mining, and anti-submarine matters in the fleets under their command, rests entirely with the various commanders-in-chief.

6. In conjunction with director of training and staff duties, who is responsible for advice on general policy and principles of training, he is responsible to the A. C. N. S. for the formulation of requirements of technical torpedo, mining, and anti-submarine training.

7. He is responsible to the A. C. N. S. for advising on the training of officers and men in the use of torpedo, mining, anti-mining and anti-submarine weapons in accordance with the instructions laid down in the training manuals and the requirements of the sea-going fleets.

8. With regard to paragraphs 6 and 7, he will keep in close touch with the director of torpedoes and mining and the director of signal division who are responsible to the second sea lord and controller for advice as to requirements in personnel and material, and for advice on that part of training which affects the safe working and maintenance of material.

9. He will at all times maintain close touch with the director of gunnery division respecting suggestions for the employment of new weapons, and with director of plans, respecting the strategical aspect of all questions referred to him.

10. He will be in direct communication with the commanding officers of the torpedo, mining, and anti-submarine schools on all questions of training in the use of weapons.

11. He will conform with paragraph 3 of the instructions for plans division.

JAPAN

LAST YEAR'S FLEET MANEUVERS: (By Hector C. Bywater.)—An interesting account of the Japanese naval maneuvers that took place in October last has been sent home by the Spanish naval attaché at Tokyo, and is now reproduced in a Spanish periodical. It appears from this narrative that nearly the whole of the effective fleet was mobilized for the occasion. The general scheme was that a hostile fleet (Blue) had arrived off the coast with the intention of penetrating to the Sea of Japan and seizing islands, and possibly harbors, on the littoral of Japan proper, for use as bases of operation. This fleet comprised the largest and most powerful ships, while the defending force (Red) was largely made up of less modern vessels. The capital ships controlled by "Blue" were the *Nagato, Fuso, Ise, Yamashiro, Kongo, Kirishima, and Hiyei.* Attached ships included five light cruisers, a large number of destroyers and two flotillas of sub-

marines. The defending fleet was also well supplied with destroyers and underwater craft, and both sides had merchant auxiliaries for use as troop transports and supply ships, besides aircraft working from shore aerodromes and floating carriers. After concentrating in the gulf of Hakata, off the coast of Kyushiu, "Blue" fleet, on October 21-23, broke into the Sea of Japan through the Tsushima Strait, and took possession of the island of Oki as a point *d'appui*, which was hastily fortified by a landing party of marines under Rear-Admiral Ishuin.

On the night of October 24 a number of "Blue" transports, under strong guard, eluded the vigilance of the Third "Red" Squadron (*Aki, Satsuma, Kashima, Katori*, etc.), and threw ashore a strong marine detachment in the gulf of Mionoseki, with the object of capturing the naval base of Maidzuru. The following day contact was made between "Blue's" main body, commanded by Admiral Tochinai, and the third squadron of "Red" fleet, and a heavy engagement was fought, both sides making free use of their aircraft. On the twenty-seventh the main body of the "Red" fleet came up, and a general fleet action developed, in the course of which the artillery duel was conducted on the most up-to-date principles of fire control, and there were repeated attacks by destroyers, and submarines. Eventually this combat was ordered to cease by Admiral Yamagata, chief of naval staff, who acted as senior umpire for the maneuvers, with his flag in the transport *Manshu*. A great many other distinguished officers, including the late Admiral Prince Higashi Fushimi, followed the operations from the battleship *Settsu*. In all there were 130 vessels of various types included in the two fleets. With the exception of a collision in which the destroyers *Hamakaze* and *Okikaze* were damaged, there were no accidents, mishaps, or breakdowns of any kind, a result that spoke well for the training of personnel and the efficiency of the material. —*Naval and Military Record*, 5 July, 1922.

AIRSHIP EXPLODES.—Tokio, July 10.—The naval airship which arrived here from England in April last exploded this morning. It is a complete wreck.

The hangar in which it was housed at Yokosuka was also destroyed. There were no casualties.—*Reuter*.

JAPAN'S NEW NAVAL PROGRAM, By Hector C. Bywater, *Special Correspondent of The Sun*.

The following table, which shows the light cruiser strength of the two navies when the new Japanese program is completed, gives food for thought:

Japan

3 Ships (*Yahagi, Chikuma, Hirado*), 5,000 tons, 26 knots, 8 6-inch guns.
2 Ships (*Tatsuta, Tenryu*), 3,550 tons, 32 knots, 4 5.5-inch guns.
10 Ships (*Kuma, Tama, Kitakami, Oh-i, Kiso, Nagara, Isudzu, Natroi, Kinu, Yura*), 5,600 tons, 32 knots, 7 5.5-inch guns.
6 Ships (*Abukuma, Kaka, Naka, Sendai, Jintsu, Ayase*), 6,500 tons, 32 knots, 8 6-inch guns.
4 Ships (*Otonase; Minase, "C" and "D"*), 7,000 tons, 32 knots, 8 6-inch guns.
4 Ships (*"E," "F," "G"* and *"H"*), 10,000 tons, 32 knots, —— 8-inch guns.

29 Ships with aggregate displacement of 185,100 tons.

United States

10 Ships (*Omaha, Milwaukee, Cincinnati, Richmond, Concord, Raleigh, Detroit, Trenton, Marblehead, Memphis*), 7,500 tons, 33¾ knots, 12 6-inch guns.

10 Ships with aggregate displacement of 75,000 tons.

London, July 6.

In their report to President Harding on the result of the Washington Conference, the American delegates affirmed that the limitation treaty "absolutely stops the competitive race in naval armaments. At the same time it leaves the relative security of the great naval powers unimpaired, No national interest has been sacrificed; a wasteful production of unnecessary armament has been ended."

This claim would be strictly true were dreadnaughts the only instrument of naval warfare, for competitive building of dreadnaught tonnage certainly has come to a dead stop. But the dreadnaught, though still the embodiment of tremendous offensive power, is no longer universally acknowledged as the most potent weapon of sea combat. Its supremacy is menaced by smaller and cheaper weapons, the development of which goes on unceasingly, while the dreadnaught itself has already reached the practicable or rational limit of evolution. Even the most stalwart champions of the great ship are not prepared to give it more than a few more years of primacy, realizing as they do the incalculable possibilities which lie in the airplane as a carrier of giant bombs and torpedoes.

Those who framed the original scheme of naval reduction were evidently cognizant of this depreciation of the great ship, for they were at pains to fix the ratios of auxiliary tonnage no less definitely than for dreadnaughts. But unfortunately the submarine dispute knocked this part of the scheme on the head, while it was also decided not to interfere with aerial armaments, on the ground that any restrictions in this connection would hamper the development of commercial aircraft and thus slow down progress which promised to be of benefit to civilization.

All the powers that signed the treaty were consequently left free to build auxiliary ships of war, subject to certain limits of displacement and battery in the case of cruisers, though strong hopes were entertained at the time that no signatory would take advantage of the loophole thus presented to augument its naval forces contrary to the spirit, if not the letter, of the treaty.

Barely two months after the treaty had been signed I was able to announce in *The Sun*, on the basis of reliable news which had reached me from Tokio, that the Japanese naval authorities were revising their shipbuilding plans with the object of making good the deficiency caused by the scrapping of so many new battleships, and had decided not only to accelerate the construction of such cruisers, destroyers and submarines as had been authorized under the "eight-eight" program of 1920, but also in every case to redesign those vessels with larger dimensions and greater fighting power. On the strength of this exclusive report to *The Sun*, other American papers charged Japan with the intention of evading her treaty obligations, though so far, at any rate, there is no evidence to support that accusation.

Meanwhile my message with regard to the increased tonnage and armament of new Japanese auxiliary craft has been confirmed by an official communique issued at Tokio by the imperial navy department on July 3. This is the first time that advance particulars of new Japanese warships have ever been published on official authority, and the fact that such a radical departure from tradition has been made is proof of Japan's desire to vindicate her *bona fides* before the world.

What she intends to do in the way of reinforcing her fighting fleet is to be done openly and without concealment. According to the communique, she has adopted an auxiliary building scheme which provides for the construction of four cruisers each displacing 10,000 tons, four cruisers of 7,000 tons each, 24 first-class torpedoboat destroyers with an aggregate tonnage of 33,000, and 24 submarines totaling 28,166 tons. This, it is claimed, represents a reduction of 13,935 tons—equivalent to one

cruiser, 13 destroyers and 24 submarines—as compared with the original program of ships to be completed by 1927, which would, however, have had a much smaller average of displacement than those now to be built. Nor is it made at all clear that the 56 new vessels represent the maximum amount of construction upon which Japan will embark between now and 1927.

To appreciate the significance of this new program it is necessary to remember that a considerable amount of naval shipbuilding is already in progress in Japan. Well-informed circles estimate the scope of this work as follows: Three aircraft carriers, including two of 26,000 tons each and one of 9,600 tons; 10 or 11 light cruisers, from 5,600 to 7,000 tons; two gunboats; 12 to 15 destroyers, and at least 25 submarines. If this computation is correct, and it is founded on exceptionally reliable data, it means that when the new auxiliary program has been put into effect Japanese naval construction will embrace the following ships: 18 or 19 light cruisers, 36 or 39 destroyers and 49 submarines, besides the airplane carriers and gunboats mentioned above. Moreover, the new vessels, with few exceptions, will be larger and more powerful in every way than the corresponding types in other navies.

Future defense requirements and the necessity of keeping alive the shipbuilding industry are the motives officially assigned for the latest program. Labor troubles which might lead to social disorder of the gravest description would, so the Japanese government declares, inevitably ensue were all naval construction to be stopped and the 60,000 workers employed thereon given their discharge. There is, no doubt, much truth in this argument; but all the same, to go on building expensive ships of war and ordering many new ones seems a curious method of placating labor. Before the Washington Conference there was a great deal of popular discontent in Japan at the inflated expenditure on naval armaments and the resulting heavy taxation. By scrapping the battleships a saving of hundreds of millions of dollars has been effected, but if so many cruisers and lesser craft are to be built the net saving will be considerably smaller than was anticipated.

As for the plea that the new vessels are needed to replace the canceled battleships in the scheme of national defense, the design of the former is more suggestive of attack than of defense. Cruisers of 10,000 and 7,000 tons would be unnecessarily large and costly for the work of guarding Japan's communications with the Asiatic mainland or protecting her home coasts, and the same true of the big submarines she proposes to lay down. Both types would, however, be very useful for preying upon enemy merchant ships and carrying the war into hostile waters.

The four 10,000-ton cruisers represent the extreme limit of size for these vessels permitted by the treaty. They will have a speed of not less than 31 knots, a battery of 7½-inch or 8-inch guns and a steaming endurance of 12,000 sea miles, or sufficient to cross and recross the Pacific Ocean with a good margin to spare. There are no cruisers of equivalent power at present in the British or the United States navy, though the four British ships of the *Raleigh* type—the nameship of which recently visited Washington—are almost as large and as fast.

If war broke out in the Pacific and these four swift, heavily armed Japanese cruisers were dispatched to harass American shipbuilding, there would be nothing to touch them in the United States navy as it is constituted at present. They would be too fast to be caught by the old armored cruisers and too powerful to be engaged with any prospect of success by scouts of the *Omaha* class. It is not too much to say that the presence of these four ships alone on the trade highways of the Pacific would be enough to paralyze American shipping in that ocean. The four 7,000-ton cruisers will be less formidable, though they also would repre-

sent a serious menace to the ocean-borne trade of a state with whom Japan was at war. In speed, battery and steaming radius they will probably be equal to the *Omaha* class.

The 24 new Japanese destroyers, with a total displacement of 33,000 tons, will average 1,375 tons each, or about 150 tons more than the largest American destroyers built up to now. On the other hand, the United States navy will still maintain the lead in destroyer strength, thanks to the huge wartime program of these craft.

Twenty-four submarines with an aggregate of 28,166 tons are included in the Japanese project, and if built to uniform design would average about 1,173 tons each. Most probably, however, they will be divided into two groups, one of medium-size ocean-going submarines and the other of large cruiser-submersibles. According to the tonnage aggregate given, it would be possible to build 12 boats of 800 tons and 12 of 1,550 tons; or, alternatively 16 of 800 tons and 8 of 1,920 tons.

All that is known for certain is that Japanese naval constructors have prepared plans for submarine cruisers as large as any that the Germans put afloat during the World War, and that special importance has been attached to wide cruising radius in the case of all Japanese submarines of recent design. There is sound authority for the statement that half the Japanese underwater craft which are now building or projected would be capable of voyaging to the American coast and back with a few thousand miles to spare.

In political and naval circles here there is some speculation as to the effect which this revival of Japanese shipbuilding activity may produce on the naval policy of the United States. Few believe the American naval authorities will rest satisfied with a cruiser establishment so much inferior to Japan's especially in view of the phenomenal growth of the American merchant marine and the necessity of taking adequate measures for its protection in the event of war.

While due allowance is made for the legitimate desire of Japan to safeguard her coasts and conserve her shipbuilding industry, it is felt here that she has acted unwisely in bringing forward a new program of such imposing dimensions so soon after the conference, and at a time when nearly every other power bound by the treaty is cutting down its naval expenditure with a ruthless hand.—*The Baltimore Sun*, 21 July, 1922.

A SUMMARIZED STATEMENT OF THE RETRACTIONS AND EXPANSIONS WHICH HAVE OCCURRED IN THE JAPANESE PROGRAM OF ARMED PREPAREDNESS, By Hector C. Bywater, *Special Correspondent of The Sun*.

London, July 14.

Now that the leading features of Japan's future naval program are known, the moment seems opportune to review the general effect which has been produced on the armament policy of the Island Empire by the Washington Conference. Taking naval preparations first, we find them to have been modified as follows:

1. Two 41,000-ton battleships actually launched have been "scrapped" in the sense that they are not to be completed, but will be used as target ships for gunnery, torpedo and aircraft experiments. Two other battleships, each of 44,000 tons, that were to have been laid down this year and for which some equipment had been ordered, have been definitely abandoned, while the designs for two ships of still greater power, which were to have been named the *Mikasa* and *Fuji*—perpetuating the names of historic craft in the old navy—have been torn up. Six great battleships that otherwise would have formed the backbone of the Japanese fleet a few years hence have thus been ruled out. A similar fate has

befallen the battle cruisers that were authorized under the famous "eight-eight" program of 1920. *Amagi* and *Akagi,* originally designed for 43,500 tons, will finally emerge in the guise of airplane carriers with their displacement cut down by some 15,000 tons. Two sister ships, *Atago* and *Takao,* of which the keels were laid while the Conference was in session, have now been broken up and no longer exist, while the plans of four mightier battle cruisers that were scheduled to hoist the pennant in 1927-28 now repose in the limbo of "might-have-beens." Therefore, of the 14 Japanese mastodons that were building, completing or on the point of being commenced when the Conference reached its decisions, 12 have completely disappeared and two are building to a much smaller and feebler design. Moreover, 10 older capital ships, dreadnaughts and pre-dreadnaughts have been withdrawn from the active fleet and are now awaiting demolition, either at the hands of the shipbreaker or as victims of shell fire, torpedo or bombing attacks. Japan has consequently fulfilled both in letter and in spirit the terms of the limitation treaty so far as it concerns capital ships.

2. As already stated, the battle cruisers *Amagi* and *Akagi* are undergoing reconstruction as airplane carriers and when completed will displace 26,000 tons each, or 52,000 tons together. Since Japan is allotted 81,000 tons of these craft, a balance of 29,000 tons will remain. However, she is also building two new airplane carriers, the *Hoshu* and *Shokala,* the first named being a 9,600-ton ship, and it is considered probable that the *Shokaku* will turn out to be a much larger vessel, approaching 20,000 tons. In any case Japan will certainly develop her plane-carrying tonnage to the full limit sanctioned by the treaty.

3. Far-reaching schemes of port and harbor improvements at the Japanese naval bases—including the construction of several huge dry and floating docks—of Kure, Yokosuka and Sasebo have been abandoned. These works, which were estimated to cost $70,000,000, have ceased to be necessary owing to the deletion of so many monster fighting ships. For the same reason a big program of extensions at the gun and armor-plate factories of Kure and Yawata, which would have doubled their present output capacity, has been dropped. The naval stations at Port Arthur, Takeshiki and Bako in the Pescadores are all to be abolished, and those at Maidzuru and Chinkai will be reduced to secondary rank.

4. The naval personnel is this year to be cut by 12,000 officers and enlisted men. As, according to preconference arrangements, the personnel during 1922 was to have reached a total of 78,400, the reduced establishment will presumably be 66,400. In spite of this cut, however, the man power at the disposal of the Japanese navy will remain very considerable, for behind the active personnel is a trained reserve of at least 40,000. In an emergency Japan could probably mobilize more trained naval officers and seamen than the United States. Compared with the large number of ships which are to be scrapped, the reduction of personnel is small. All remaining ships are to have their complements increased and will thus be maintained on a footing of immediate readiness for action.

5. The grand fleet maneuvers which were to have been held in the coming fall are said to have been cancelled for reasons of economy.

At first glance the foregoing list of reductions seems very imposing, but it is qualified by a number of factors, the chief of which is that concurrent reductions on a far larger scale are taking place in the navies of Britain and the United States. Then, again, Japan is adopting a series of measures the cumulative effect of which will be to strengthen her naval power very considerably in everything but capital ships. These measures may be enumerated as follows:

1. The seven-year building program authorized in 1920 has been redrafted so far as it relates to auxiliary combatant ships, and the whole of these vessels which remain to be built have been designed afresh on a new basis of size and power. Construction will also be pushed forward to insure their coming into service well in advance of the dates first contemplated. The most important units of this revised program are four cruisers of 10,000 tons apiece. Steaming over 30 knots and mounting a battery of 8-inch 250-pounder guns, they will be the heaviest and most formidable cruising ships under any flag. No doubt the intention is for these vessels to replace in some degree the eight battle cruisers which Japan forfeits under the treaty. In addition, four small cruisers will be built, each displacing 7,000 tons, with very high speed and powerful rapid-fire armament, and storing sufficient oil fuel to endow them with a radius of 12,000 miles. When these eight vessels are ready the Japanese cruiser fleet—as I pointed out in a previous article—will comprise 29 modern ships with an aggregate displacement of 185,100 tons. It is true that Britain is completing four cruisers and the United States ten, but all of them are belated survivors of war programs and would ordinarily have been in service years ago. The eight Japanese ships are, on the contrary, part of a post-war program, and the improvements which their design has undergone will make them individually more powerful than the British or American vessels. I may add that all the new Japanese cruisers will be equipped to carry and launch airplanes.

2. Twenty-four big destroyers are to be built, each of 1,375 tons, with a speed of 36 knots and mounting four 4.7-inch rapid-fire guns. They will be the largest vessels of their type in the world, with the exception of 12 British flotilla leaders. The submarine construction program covers 24 new boats, of which a certain number will be ocean-going boats of 900 to 1,000 tons, and the remainder "cruiser submersibles" of 1,600 tons each, with a radius of 16,000 to 20,000 nautical miles. When they are completed will possess approximately 100 submarines, and 72 of these will be ocean-going boats with a range of action varying from 7,500 miles in the smallest to 20,000 miles in the largest types. No other navy has anything like as many submarines capable of undertaking prolonged ocean voyages. I have previously stated in *The Sun* that the Japanese submarine program was considerably more advanced than is generally known. For instance, the navy year-books show No. 50 as the latest boat building, whereas positive information reaches me that boats running well into the sixties have already been launched. The new building program further includes a number of colliers, oil-tankers, fleet repair ships and other auxiliaries.

3. Navy training is to be reorganized on the most modern and progressive lines. Larger appropriations will be made in future for research and experimental purposes, and for gunnery and torpedo practice. A higher standard of battle efficiency and especially in long-range firing, is to be demanded of the whole fleet, to which end its equipment will be thoroughly modernized. In a word, the Japanese battle fleet, small though it be, is to be developed into a compact hard-hitting force with a punch in every ton of displacement.

4. The navy air service is to be strengthened and generally improved. A big increase in the number of machines and personnel is contemplated, additional aerodromes are to be provided and training will be conducted on the most up-to-date principles. In due course every capital ship and light cruiser will be fitted to carry one or more fast combat planes.

5. The shore defenses along the coast lines of Japan are to be reinforced. It is planned to utilize for this purpose the heaviest of the guns taken out of scrapped capital ships. A special appropriation has been

made for developing the naval mine service, both for harbor defense and aggressive operations.

Turning now to her land armaments we find Japan preparing to cut down the standing army by 56,000 enlisted men, but at the same time it is clear from published statements by General Yamanashi, the war minister, that the bulk of the money thus saved is to be spent on new equipment, such as artillery, tanks and automobile transport. A start has already been made with the creation of new batteries of super-caliber howitzers and long-range guns.

In view of all this preparedness by sea and land it does not look as though the Washington Conference had weakened Japan's faith in the virtue of powerful armaments. She is now much stronger relatively than before, and her supremacy in the Far East is practically unassailable by direct military action.

To make assurance doubly sure she is gradually consolidating her influence in China, with the object of attaining such complete hold over the richest areas, particularly Manchuria and Mongolia, that their entire resources in foodstuffs, coal, iron and other products would be at her disposal in the event of war. So much has been virtually admitted by recent official utterances.—*The Baltimore Sun,* 28 July, 1922.

GERMANY

GERMANY AND THE RUSSIAN NAVY.—A writer in the current number of the French *Revue Universelle,* who signs himself Alain Mellet, is much perturbed at the prospect, which he regards as imminent, of Germany regaining a large measure of her former sea power by taking over the Russian Baltic fleet and constructing many new submarines in the Russian dockyards. After enumerating the supposed paper strength of the Baltic fleet, he draws attention to the four huge battle cruisers of the *Borodino* class which are not yet armed, though "news has reached Paris that arrangements are being made to effect their complete armament with the shortest possible delay." Information has also reached Paris that a German mission arrived at Kronstadt a few weeks ago and took complete command of the arsenals there. Another item of news which the writer of the article claims to have heard is that Germany has despatched to Kronstadt "more than 200 Diesel engines, all of which are certainly not reserved for Russian submarine use," and he infers therefrom that Germany is already using the Russian yards for the secret building of submarines.

Finally, he informs us that Russian naval maneuvers were to begin in the Baltic on July 6, Finland having been officially notified to this effect so that her fisherman might have due warning. This is not by any means the first time that the possibility of Russo-German naval cooperation has been discussed since the war, and the recently concluded Treaty of Rapallo—which is known to involve some military understanding, if not a definite agreement has, of course, brought such cooperation into the realm of probabilities. Nevertheless, inquiries made in well-informed quarters in London have failed to elicit any corroborative evidence of the positive statements made by M. Mellet. Nothing is known there of the arrival at Kronstadt either of a German naval mission or a large consignment of Diesel engines, and it is suggested that London as a rule is quite as well-informed on current Russian affairs as Paris.

A STAY-AT-HOME FLEET.—It is true there have been rumors that the Russian fleet would shortly carry out exercises in the Baltic. On the other hand, it is considered more than doubtful whether that fleet, or any considerable section of it, is at present in a condition to put to

sea, let alone engage in tactical maneuvers. About five years have elapsed since any Russian ship above the rank of destroyer was seen outside harbor, and even if the vessels themselves had been kept in good order during the intervening period, it goes without saying that their crews must have lost all touch with the rudiments of sea-going duty. In any case, therefore, the fighting efficiency of the Baltic fleet would be at a low ebb for a long time to come, and it would take more than a German naval mission to put the ships and crews into battle trim at short notice. There is, moreover, a strong suspicion that many of the vessels have deteriorated or been damaged beyond repair.

Without going into particulars, it may be said with confidence that at least half of the heavy ships named by M. Mellet as representing the future Baltic fleet under German command are useless for any service but harbor defence, and perhaps incapable even of that. As regards the complete arming of the four unfinished battle cruisers, this would necessitate the manufacture of not less than forty-eight 14-in. guns, with their mountings, accessories, ammunition, etc., without counting reserve pieces or the secondary armaments. In view of the chaotic state of Russian industry at present, it seems doubtful if this large ordnance contract could be executed within the early future. Although the work of manufacturing the artillery equipment of these vessels was begun late in 1912, slow progress was made, and it is believed that such of the guns as had been completed on the outbreak of war were requisitioned either for field or coast defence service.—*Naval and Military Record,* 12 July, 1922.

THE AFRICAN CRUISE OF ZEPPELIN L59.—In the spring of 1917 the German colonial troops in East Africa were almost ready to surrender to the Allies for lack of ammunition and hospital supplies. Accordingly, at the suggestion of the chief of the medical section of the German staff, the German war department decided to forward the needed supplies by airship. As this involved a journey of unprecedented length and with a great military load, a number of experiments to prove the feasibility of carrying out such a plan were ordered. The German army airship *LZ120* had succeeded in maintaining the air for 101 hr. just a few weeks previously, so no insuperable difficulties were anticipated.

Type of Airship Used

A preliminary investigation showed that an airship of the same type, but lengthened by 100 ft. and having a capacity of 2,365,000 cu. ft. would be required to carry the contemplated load of 14 tons over the 4460 miles of distance to be covered. Assuming a cruiser speed of 40 m.p.h., the trip was expected to be made in 110 hr. after the usual laboratory test, orders were given for the construction of the ship, and the work was begun without delay. This ship, called the *L57* was ready for its initial flight just four weeks afterward (Oct. 7, 1917). A sudden storm however, destroyed the ship while attempting a landing at Jüterborg.

In the remarkably short time of fourteen days the second ship was completed and christened the *L59*. Without further delay it was sent successfully to Jamboli, Bulgaria, the airbase of the German troops then operating in Roumania. After some further test flights the ship was loaded and "took off" for East Africa at 8.34 P. M. on Nov. 21, 1917.

While the *L59* was in the vicinity of Khartoum, on the Upper Nile, at Lat. 16° 30′ N., Long. 30° 0′ E. wireless information was received to the effect that the German troops had surrendered to the British and the ship was recalled to its base, where it landed at 7:35 A.M. on Nov. 25. The ship had been in the air uninterruptedly for 95 hr. and had

covered a distance of 4250 miles at an average speed of about 44 m.p.h. From a technical viewpoint the trip was highly successful, and the results obtained show that had not political events intervened, the goal would have been reached in four day's flying without trouble. It was proven that airship transportation under the given conditions is eminently satisfactory and that large cargoes can be carried without difficulty for distances requiring several consecutive day's navigation.

The military load carried on this voyage by the *L59* was apportioned as follows:

Hospital supplies	6,548 lb.
Ammunition	16,354 "
Ordnance	7,191 "
Sewing outfits	440 "
Mail	116 "
Astronomical instruments	112 "
Books	116 "
	30,877 lb.

—*Aviation,* 31 July, 1922.

ANTECEDENTS OF GERMAN FLEET MUTINY.—Over two hundred machine-guns and large stocks of ammunition have been discovered at the Kiel naval arsenal by officers of the Inter-Allied Commission, the weapons so found being in excess of the number authorized by the Treaty of Versailles. As a Berlin correspondent truly remarks, that they should have been deliberately concealed on premises directly under the control of the German Government renders the case much more serious than that of the howitzers which were hidden in the Rockstroh factory near Dresden. The workmen at the arsenal are reported to be very indignant with the officials responsible for this concealment, and are said to have demanded their dismissal, though it is scarcely credible that the arms could have been hidden away without the cognizance of some of the men. To those who have been watching the reorganization of the German navy during the past three years there is nothing surprising in this discovery, for it has long been evident that the "Reichsmarine" has been brought largely under the control of the Monarchists. Naval officers, both active and retired, have been conspicuous in every counter-revolutionary movement, from the Kapp "Putsch" to the plots against leading members of the Republican administration. The German navy is itself a hotbed of reaction. All the "disaffected" elements have been weeded out. The officers, from the departmental chief, Admiral von Behncke, down to the youngest Fähnrich, are said to be ardent "Kaiser's men," and it is their boast that the lower-deck personnel have been carefully selected with a view to their political opinions. It is admitted, however, that the dockyard workers are still a doubtful quantity. Hence the proposal to close down all the existing naval bases with the exception of Wilhelmshaven, and concentrate all the shore establishments and facilities at that place, which could then be staffed exclusively by officials and men who were free from the taint of Republicanism.

A manifesto published in December, 1918, by the "Deck Officers' Union" (Deckoffizierbund), and representing "the unanimous conviction of 4,000 warrant and petty officers of the German navy, all of whom have served from 15 to 25 years," purported to explain the root cause of the deterioration of discipline which brought about the final collapse. The following is a summary of this interesting document:

"None will deny that up to the beginning of the 'nineties the spirit of our navy was excellent. At that time the connecting link between officers and men was, in the truest sense of the word, the warrant officer. Between all ranks and ratings there prevailed a sentiment of comradeship that found expression in the implicit confidence which the men reposed

in their leaders. However, soon after the accession of Emperor William the second a new spirit made itself manifest among the officers as a result of imperial favoritism. The consequence was that the naval officer tried to get rid of everything that tended to weaken his influence and prestige, and in the course of years the warrant officer was gradually ousted from his old position and reduced to the same level as the men. The connecting link was thus broken. Moreover, sea-men no longer aspired to warrant rank, which had ceased to mean a desirable career, and in the last years before the war all the best and most efficient men had cut loose from the service as soon as their time was up. Even between themselves and the so-called "specialist" officers, such as engineers, paymasters, etc., the executive officers had created a wide gulf both socially and in the service. By the outbreak of war the executive branch had constituted itself an hermetically-sealed corps. Working exclusively for their own interests, they cared nothing for the welfare of those subordinate to them, and were blind and deaf to the grievances of the men. The executive officer soon came to be regarded by the men as the embodiment of ignorance, pride, and arrogance, and in these circumstances it is not surprising that they eventually lost all confidence in their appointed leaders, regarding them with feelings of hatred and bitterness. Thus the blame for the collapse rests primarily with the officers, one and all of whom, from Tirpitz to the youngest sub-lieutenant, were animated by the pan-German spirit."—*Naval and Military Record,* 19 July, 1922.

GERMAN SUBMARINE LOSSES.—From German official sources comes the following statement of submarine losses during the war. The total number of submarines sunk, interned, and captured is given as 199. Thirty-one of these were sunk in the North Sea, and of these 3 in German coastal waters. In the Channel 56 were lost, and 12 more in its western approaches. Elsewhere on the coast of the British Isles 43 units were accounted for: 5 on the west coast of England, 18 on the east coast, 2 near Scapa Flow, 9 on the Irish coast, 7 in the Irish Sea, and 2 off the Shetlands.

In the Mediterranean 17 were sunk, 4 in the Black Sea, 2 in the Arctic, 2 in the Atlantic, and 3 in the Baltic. One was lost on the Danish coast, 2 on the French coast of the North Sea, 3 on the German coast, and 2 on the Belgian coast.

Five submarines were interned in Spain and 2 in Holland. Seven were destroyed at Pola, 1 at Caltaro, 1 at Trieste, 1 at Fiume, and 4 in Flanders before the German retreat.

In these units there were lost in all 517 officers and about 5,000 men.

UNITED STATES

Navy Department Bureau of Construction & Repair, Washington, D. C.

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of June 30, 1922

Type Number and Name	Contractor	Per cent of Completion: July 1, 1922 Total	July 1, 1922 On Ship	June 1, 1922 Total	June 1, 1922 On Ship	Contract date of Completion	Probable date of Completion
		BATTLESHIPS (BB)					
45 *Colorado*	New York S.B. Cpn.	92.7	92.3	92.3	91.8	....	Indefinite
47 *Washington*	New York S.B. Cpn.	75.9	70.[illegible]	75.9	70.3	....	Indefinite
48 *West Virginia*	Newport News S. B. & D. D. Co.	82.5	81.2	81.5	80.1	....	Indefinite
49 *South Dakota*	New York Nvy. Yd.	38.5	31.6	38.5	31.6	....	Indefinite
50 *Indiana*	New York Nvy. Yd.	34.7	27.2	34.7	27.2	....	Indefinite
51 *Montana*	Mare Island Nvy Yd.	27.6	19.	27.6	19.	....	Indefinite
52 *North Carolina*	Norfolk Nvy. Yd.	36.7	27.1	36.7	27.1	....	Indefinite
53 *Iowa*	Newport News S. B. & D. D. Co.	31.8	27.4	31.8	27.4	7/12/23	Indefinite
54 *Massachusetts*	Beth. S.B. Cpn. (Fore River)	11.	4.3	11.	4.3	7/12/23	Indefinite
		BATTLE CRUISERS (CC)					
1 *Lexington**	Beth. S.B. Cpn. (Fore River)	33.8	24.2	33.8	24.2	....	Indefinite
2 *Constellation*	Newport News S. B. & D. D. Co.	22.7	19.5	22.7	19.5	....	Indefinite
3 *Saratoga*	New York S.B. Cpn.	35.4	28.	35.4	28.	....	Indefinite
4 *Ranger*	Newport News S. B. & D. D. Co.	4.	1.5	4.	1.5	....	Indefinite
5 *Constitution*	Philadelphia Nvy. Yd.	13.4	8.4	13.4	8.4	....	Indefinite
6 *United States*	Philadelphia Nvy. Yd.	12.1	7.1	12.1	7.1	....	Indefinite
		SCOUT CRUISERS (LIGHT CRUISERS) (CL)					
4 *Omaha*	Todd D.D. & Const. Cpn.	99.2	94.8	99.2	94.8	8/ 1/21	Indefinite
5 *Milwaukee*	Todd D.D. & Const. Cpn.	95.8	92.9	95.	90.4	12/ 1/21	Indefinite
6 *Cincinnati*	Todd D.D. & Const. Cpn.	88.2	83.8	88.2	82.6	7/ 1/22	Indefinite
7 *Raleigh*	Beth. S.B. Cpn. (Fore River)	69.2	54.3	67.4	51.4	8/ 1/21	Indefinite
(*a*) 8 *Detroit*	Beth S.B. Cpn. (Fore River(	88.5	80.	86.4	77.1	11/ 1/21	10/ 1/22
9 *Richmond*	Wm. Cramp & Sons Co.	93.	87.4	92.	86.	....	10/ 1/22
10 *Concord*	Wm. Cramp & Sons Co.	86.5	79.5	86.	79.	....	1/ 1/23
11 *Trenton*	Wm. Cramp & Sons Co.	59.5	47.5	59.5	47.5	10/ 1/21	3/ 1/23
12 *Marblehead*	Wm. Cramp & Sons Co.	47.5	33.5	47.5	33.5	1/ 1/22	0/ 1/23
13 *Memphis*	Wm. Cramp & Sons Co.	40.5	26.5	40.5	26.5	4/ 1/22	3/ 1/23
		AUXILIARIES					
Repair Ship No. 1,	*Ledusa* (AR1) Puget Sd. Nvy. Yd	83.4	74.2	81.9	72.5	....	Indefinite
Dest. Tender No. 3,	*Dobbin* (AD3) Phila. Nvy. Yd.	72.5	72.3	71.9	71.6	....	Indefinite
Dest. Tender No. 4,	*Whitney* (AD4) Boston. Nvy. Yd.	57.6	50.3	54.5	48.2	....	Indefinite
Sub. Tender No. 3,	*Holland* (AS3) Puget Sd. Nvy. Yd.	21.5	5.5	21.5	5.5	....	Indefinite
		PATROL VESSELS					
Gunboat No. 22, Nvy. Yd.	*Tulsa* (PG22) Charleston	75.	64.9	74.	63.7	....	Indefinite
		DESTROYERS					
No. 339 *Trever*	Mare Island Nvy. Yd.	99.8	99.8	99.8	99.8	....	....
No. 340 *Perry*	Mare Island Nvy. Yd.	99.8	99.8	99.8	99.8	....	....
No. 341 *Decatur*	Mare Island Nvy. Yd.	99.5	99.5	97.	97.	....	7/15/22

Destroyers authorized but not under construction or contract.
(12) Nos. 348 to 359 inclusive. Number Ready for commissioning.
a Scout (Light) Cruiser No. 8—*Detroit*—Launched June 29, 1922.
* Ordered converted to Airplane Carrier.

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—Progress as of June 30, 1922

Type Number and Name	Contractor	Per cent of Completion July 1, 1922 Total	July 1, 1922 On Ship	June 1, 1922 Total	June 1, 1922 On Ship	Contract date of Completion	Probable date of Completion
SUBMARINES							
115 *S-10*........	Portsmouth, N.H., Nvy. Yd..................	96.6	96.	96.4	95.7	....	9/15/22
116 *S-11*........	Portsmouth, N.H., Nvy. Yd..................	94.8	94.1	94.7	93.8	....	Indefinite
117 *S-12*........	Portsmouth, N.H., Nvy. Yd..................	93.9	92.5	93.8	92.3	....	Indefinite
118 *S-13*........	Portsmouth, N.H., Nvy. Yd..................	92.9	90.9	92.7	90.6	....	Indefinite
123 *S-18*........	Elec. Boat Co. (Quincy)..	98.5	98.5	98.5	98.5	7/ 1/22	....
124 *S-19*........	Elec. Boat Co. (Quincy)..	98.	98.	98.	98.	9/30/22	....
125 *S-20*........	Elec. Boat Co. (Quincy)..	98.5	98.5	98.5	98.5	10/30/22	....
126 *S-21*........	Elec. Boat Co. (Quincy)..	97.5	97.5	97.5	97.5	10/30/22	....
127 *S-22*........	Elec. Boat Co. (Quincy)..	98.5	98.5	98.5	98.5	10/30 22	....
128 *S-23*........	Elec. Boat Co. (Quincy)..	98.5	98.5	98.5	98.5	11/30/22	....
129 *S-24*........	Elec. Boat Co. (Quincy)..	95.5	95.5	94.5	94.5	11/30/22	....
130 *S-25*........	Elec. Boat Co. (Quincy)..	98.	98.	96.5	96.5	11/30/22	....
131 *S-26*........	Elec. Boat Co. (Quincy)..	94.	94.	93.5	93.5	12/30/22	....
132 *S-27*........	Elec. Boat Co. (Quincy)..	92.5	92.5	92.	91.5	12/30/22	....
133 *S-28*........	Elec. Boat Co. (Quincy)..	93.	92.7	92.5	92.2	12/30/22	....
134 *S-29*........	Elec. Boat Co. (Quincy)..	92.	91.5	91.5	90.7	1/30/23	....
*135 *S-30*.......	Elec. Boat Co. (San Fran).	....	....	....	....	1/30/23	....
*136 *S-31*.......	Elec. Boat Co. (San Fran).	....	....	99.5	99.5	1/30/23	....
137 *S-32*........	Elec. Boat Co. (San Fran).	99.5	99.5	98.	97.8	2/28/23	....
*138 *S-33*.......	Elec. Boat Co. (San Fran).	....	....	....	....	2/28/23	....
139 *S-34*........	Elec. Boat Co. (San Fran).	98.2	98.	96.9	96.4	2/28/23	....
140 *S-35*........	Elec. Boat Co. (San Fran).	95.7	95.1	95.	94.3	3/30/23	....
141 *S-36*........	Elec. Boat Co. (San Fran).	94.6	93.9	93.6	92.6	9/20/22	10/10/22
142 *S-37*........	Elec. Boat Co. (San Fran).	93.5	92.6	92.9	91.9	10/10/22	10/25/22
143 *S-38*........	Elec. Boat Co. (San Fran).	89.8	88.	89.3	87.4	10/30/22	11/10/22
144 *S-39*........	Elec. Boat Co. (San Fran).	87.1	84.7	86.9	84.5	11/19/22	11/25/22
145 *S-40*........	Elec. Boat Co. (San Fran).	84.9	81.9	84.7	81.7	12/ 9/22	12/11/22
146 *S-41*........	Elec. Boat Co. (San Fran).	87.	84.5	86.8	84.3	12/29/22	12/26/22
153 *S-42*........	Elec. Boat Co. (Quincy)..	87.5	77.	86.3	75.4	5/15/23	....
154 *S-43*........	Elec. Boat Co. (Quincy)..	88.5	78.8	87.4	77.3	6/15/23	....
155 *S-44*........	Elec. Boat Co. (Quincy)..	86.	75.	84.9	73.5	6/15/23	....
156 *S-45*........	Elec. Boat Co. (Quincy)..	86.8	76.	85.6	74.4	7/15/23	....
157 *S-46*........	Elec. Boat Co. (Quincy)..	85.3	73.9	84.	72.1	7/15/23	....
158 *S-47*........	Elec. Boat Co. (Quincy)..	85.1	73.7	84.1	72.3	8/15/23	....
159 *S-48*........	Lake T.B. Co. (Bridgeport)................	98.3	98.3	98.3	98.3	7/ 1/21	9/ 2/22
160 *S-49*........	Lake T.B. Co. (Bridgeport)................	Del. 6/5/22		99.6	99.6	8/ 1/21	....
162 *S-51*........	Lake T.B. Co. (Bridgeport)................	Del. 6/24/22		99.2	99.2	10/ 1/21	....
FLEET SUBMARINES							
163 *V-1*..(SF4).	Portsmouth N.H. Nvy. Yd..................	25.7	24.5	24.1	22.9	....	10/-/24
164 *V-2*..(SF5).	Portsmouth N.H. Nvy. Yd..................	22.5	....	21.9	....	....	....
165 *V-3*..(SF6).	Portsmouth N.H. Nvy. Yd..................	22.3	....	21.8	....	....	....

Note: Submarines authorized but not under construction or contract: Fleet Submarines (6) Nos. 166-171. Neff Submarine (1) No. 108.

* Hull complete. Engineering work only.

DEFENSE PLANS FOR AMERICA.—Washington, July 23.—For the first time in American military history definite defense plans, one for the land forces and the other for the sea forces, have been drafted by the experts of the two services.

That proposed by the navy department will round out the United States navy in accordance with the provisions of the Washington Armament Treaty, if Congress grants the requests to be presented. These

requests will recommend a building program of light cruisers, submarines and other auxiliary war craft.

Pershing Submits Army Plan

The program for the army, drafted after months of study by the general staff, was framed in accordance with the terms of the National Defense act of 1920. Military experts believe it would serve successfully to defend continental United States against any sudden attack and at the same time would amply provide for general mobilization behind the lines of defense.

An outline of the army plan was submitted in the form of a memorandum to Secretary of War Weeks by General John J. Pershing, chief of staff. It was described by General Pershing as a "national position in readiness."

To Conform to Other Programs

The purpose of the navy plan is to conform to the building programs of England and Japan and to preserve the existing 5-5-3 ratio among the three leading naval powers.

For several months the general board, in co-operation with the heads of the navy's technical bureaus and under the supervision of the chief of operations, has been working on plans for rounding-out the new navy.

For the first time in its history the United States has a definite naval policy. This was automatically fixed by the naval limitation treaty. While in letter the treaty defines the battleship ratio only, in spirit, the same ratio applies to the auxiliary craft on which no limitations were placed except that the maximum tonnage of any craft could not exceed 10,000 tons. Our naval policy therefore is to build only enough tonnage of various types to round out our navy and maintain it on the same relative footing with the other two.

Some time ago a tentative building program was submitted to the general board for consideration as a working basis for the recommendations the board is expected to submit to the Secretary before the opening of the next Congress. Of course, no battleship building is contemplated except the completion of the *West Virginia* and *Colorado,* as the replacement of the older ships will not begin until 1931. The program is understood to provide in part:

To Keep Pace with Japan

1. Completion of the 10 light cruisers now building and authorization for starting work on a sufficient additional number to keep pace with the British and Japanese.

2. Construction of several submarines of the scout and mine-laying type in addition to finishing the three fleet under-water boats now being built.

3. A more rapid development of aviation, specializing in new types of planes and completion of the two huge airships, one in Germany and the other at Lakehurst, N. J.

For Aircraft Carriers

4. An increase in funds allotted to the conversion of the two new battle cruisers into aircraft carriers so as to expedite as much as possible the completion of these two badly needed units of the fleet.

These are the high lights of the tentative program now under consideration, and it is being worked out with the expressed intention of making the treaty navy the most effective one possible.

High naval officials are watching with keen interest the naval plans in Japan as a result of her expressed intention of building additional

cruisers, submarines and destroyers. These officials believe that to obtain the best results from the limitations conference it is imperative that the status quo in auxiliary war craft, as well as in battleships, be maintained so that when the nations meet again around the council tables to renew the pacts the relative strength will still be in the ratio it now has.

Shows Only Slight Reduction

According to the best information obtainable, making due allowances for the apparent discrepancies, for instance, in Baron Kato's recent outline of Japan's naval program and other sources equally as authoritative, the Japanese building program at present shows a reduction of a little less than 14,000 tons from the very ambitious pre-conference "8-8 program," an insignificant figure compared to the total.

This old program called for 26 cruisers of 146,750 tons, 94 destroyers of 102,566 tons and 93 submarines of 82,852 tons, a grand total to be built of 331,168 tons. This, of course, does not include any mention of airplane carriers, submarine tenders, gunboats, tankers and other smaller auxiliaries.

Tokio Plans Affect U. S.

While there is no disposition on the part of naval officers here to question the sincerity of Japan in regard to her building plans and general naval policy, they believe there are certain phases of this policy that should have a direct bearing on our own future plans.

One of the interesting changes that Japan has made in her program since the Conference is the substitution of four 10,000-ton cruisers, the limit in size cruisers of 5,500 tons each, as originally planned.

In the matter of cruisers the American navy is "out of the running" in competition with England and Japan, having none now and only 10 building, while Japan has 17 built or contracted for, and England has 45.

Because of the sweeping reduction in the size of the regular army, ordered by the present Congress, the general staff has faced a difficult problem in reorganizing the actual and potential military forces of the country for a possible emergency. The plans so far drawn do not take into consideration an offensive war, but are confined, for the time, to insuring the country against an enemy assault upon the United States coasts, until the full military power of the nation could be brought into play.

Would Prevent Landing

The important phase of the new system is a distribution of the trained or semi-trained military forces to so cover the coasts and frontiers of the country that no enemy landing would be possible. To this end the war department, of course, leans heavily upon the navy as well as upon its own coast defense fortifications.

"With 18 divisions and appropriate auxiliaries of the National Guard, supplemented by the regular army, prepared for necessary expansion," the General says in his report to Secretary Weeks, "and with certain special units formed in the organized reserves, we shall be able to cover our coasts and land frontiers against serious invasion at the start."

Would Give Time for Training

"Behind this first line," the General continues, "the remaining units of the organized reserves, fully constituted with a framework of officers and non-commissioned officers, will be prepared to undertake the training of their raw recruits at once. We shall thus be able deliberately to develop our military power to any necessary extent without risk of serious disaster through surprise at the outbreak of war and without

the necessity of maintaining a burdensome military establishment in time of peace."

Such a military organization as is now planned causes no menace to any other nation, the general staff insists, but assures the impregnability of continental United States in the event of attack by any possible hostile combination.

It is recognized by General Pershing and his associates that the citizen components of the army only can be partially trained before actual mobilization. While national defense, it is pointed out, includes more than the security of the United States against an attack, the initial accomplishment of that security will afford time for the orderly development of the country's great military resources.

Pershing Cites Illustration

"For the purpose of illustration," General Pershing says in his memorandum, "let it be assumed that a National Guard division is assigned the initial mission of defending a given beach sector. Upon mobilization the combatant elements of this division at peace strength would be ordered to a training area within reach of this sector, which would be prepared for defense.

"Thereafter it would be practicable to complete the mobilization, equipment and training of the division at war strength. Continuous development in the beach position would not be necessary after its preparation for defense. The troops could be moved back to a convenient training area, and could rely upon naval and air reconnaissance to give ample warnings of a possible attack."

It is obvious, the General further points out, that this plan will greatly simplify training, equipment and mobilization projects. There will be one course of training and development designed to prepare the troops for such further military operations as may be required. This latter course of training will make provision for the development of the full offensive strength necessary to victory.

Holds Initial Advantage

"The character of our military resources," the General declares, "as well as our attitude toward other nations, imposes upon us an initial strategic defensive. But this does not involve renouncing a subsequent offensive. Had the United States in the spring of 1917 possessed 25 or 30 divisions completely organized and equipped, but only sufficiently trained to meet the requirements of the 'national position in readiness' now outlined, each of these divisions would have been advanced many months as compared with the entirely new divisions that it was necessary to create."—*The Baltimore Sun,* 24 July, 1922.

THE NAVAL RESERVE.—In his hearings before the Senate Naval Committee, Captain J. P. Parker, U. S. N. R. F., president of the Naval Reserve Officers' Association, reviewed the whole naval reserve problem in a most comprehensive way. He showed convincingly not only why an adequate reserve is necessary, but also of what its essentials should consist, and in what manner they could be obtained.

Captain Parker pointed out that the question of cost must necessarily prevent any nation from maintaining during peace a regular navy large enough for war purposes. Yet when war comes the need for rapid augmentation of naval forces manned with competent personnel is urgent. Only a naval reserve can meet such need, and the smaller the reduction of regular forces during peace, below war requirements, the larger should be the reserve.

Considering the great waste of funds necessarily incidental to undertaking war when not prepared, a naval reserve force is manifestly an economy. But it is more than insurance against great monetary loss. No matter how much money is wasted in going to war, it cannot insure national safety unless those who go out to fight are efficient. At the outbreak of war there is normally an abundance of men sufficiently patriotic to volunteer in the navy. But few of them ever possess sufficient, naval efficiency, in any form. Training preliminary to service is indispensable if defeat and useless waste of life are to be avoided.

Captain Parker says: "Efficiency is a combination of knowledge and discipline. Knowledge is gained by work, but discipline comes from practice, something that has got to be learned by constantly living under certain conditions. Correct habits of a military character cannot be acquired in a day. They must be practiced constantly until the brain and the body learn to react under service conditions. The result is there is more to a sailor than the uniform he wears. He must have a military way of thinking and acting, so that his brain and his body will react properly under service conditions. Civil life does not teach these things. We must train a civilian until he has reached a stage of usefulness to the navy. The navy must be able to count on him, knowing his deficiencies as well as his effectiveness."

During the last war three month's preliminary training was considered indispensable before a man could even be assigned afloat. In a rational sense, he was not then a trained man. But the exigencies were such that partial training had to suffice. Three months may be taken as the minimum time that must be devoted to training ashore before a recruit is fit to be sent afloat. Can we afford to wait three months after the next war begins before placing our fleet in a status even approaching a war footing? Decidedly not. In war nearly everything can be afforded except loss of time. The necessary additional personnel to mobilize the fleet must be trained in advance of war.

There are about 350,000 ex-naval reservists in the country whose naval experience is a valuable asset, and will continue to be so if short intervals of training are repeated yearly. Otherwise they will lose their naval value rapidly. The House omitted from the naval appropriation bill any funds for such purpose. Fortunately the Senate was persuaded to provide sufficient money to perpetuate a nucleus of 6,000 officers and 10,000 men during the coming fiscal year. Meantime it is hoped that the navy department's plan of reorganization for the naval reserve can be put into effect, and that hereafter funds for the training of a much larger number will be appropriated.

Captain Parker testified that in order to hold this nucleus to start building up this reserve we need these three things: "*Cruises*, in order that they maintain efficiency; meeting places or *armories*, where they can meet together for drills and instruction, and, in order to put them on a parity with the land volunteer forces, *drill pay* for those drills."—*Army and Navy Journal*, 8 July, 1922.

NAVAL RESERVE STRENGTH FIXED AT 1,500 OFFICERS AND 5,000 MEN.—The strength of the naval reserve was tentatively fixed at 1,500 officers and 5,000 men at a conference between Acting Secretary of the Navy Roosevelt and representatives of the reserve which concluded on July 19. The naval reserve were represented by Captain Edward A. Evers, of Chicago; Captain James T. Parker, of Boston, and Lieutenant Commander R. T. Brodhead, of Detroit. Officers from the different bureaus and Captain Ernest L. Bennett, U. S. N., in charge of the reserve section of the navy department, participated in the conference.

Under the provisions of the naval appropriation bill, $3,000,000 was appropriated for the maintenance and training of the naval reserve. Of this $200,000 is to be expended for the rent and other expenses of maintaining armories and offices for the reserves.

The task before the conference was to allocate $2,800,000, which, under the provisions of the law, is to be expended on the pay of reserve officers on active duty with the reserves, the maintenance of ships, the pay of officers and men while attending maneuvers and taking training.

After an extended discussion of all of the expenses connected with the two weeks' training period and other maneuvers of this summer it was decided that there would probably be sufficient funds to place 1,500 officers and 5,000 men upon the retainer pay basis. Under the plans proposed this many officers and men will be transferred from Class 6 to Class 1 on January 1. Plans are being worked out under which the transfer will be made by the navy department before that date. In all probability no officer or enlisted man who does not take the training this summer will be eligible for retainer pay.—*Army and Navy Journal,* 29 July, 1922.

MERCHANT MARINE

EX-GERMAN TONNAGE ACQUIRED BY TRANSATLANTIC LINES.—With the sale to the Royal Mail Steam Packet Company of the steamer *Muenchen*, the last of the vessels which Germany was compelled to surrender under the terms of the peace treaty, it is now possible to tabulate the amount of ex-German passenger tonnage acquired by the leading transatlantic steamship lines. Of the 32 freight and passenger vessels of 612,751 tons mentioned in the sojourning list, 15 of 256,918 tons belong to the United States Government. The seven of 94,817 tons marked with a star have never been reconditioned and may never take to the seas again. Among the private shipping concerns the White Star Line acquired the greatest amount of German passenger tonnage and the French Line the least.

The following table shows the amount of ex-German tonnage acquired by the various transatlantic lines since the outbreak of the war:

	Tons	Tons
CANADIAN PACIFIC		
Empress of Australia, ex-*Tirpitz*	21,400	
Empress of India, ex-*Prinz Friedrich Wilhelm*	17,099	
Empress of Scotland, ex-*Kaiserin Auguste Victoria*	24,581	
		63,080
CUNARD LINE		
Berengaria, ex-*Imperator*	52,022	52,022
FRENCH LINE		
La Bourdonnais, ex-*Scharnhorst*	8,388	
Roussillon, ex-*Goeben*	8,800	
		17,188
GREEK LINE		
Constantinople, ex-*Bremen*	11,540	
King Alexander, ex-*Cleveland*	16,960	
		28,500
ITALIAN GOVERNMENT		
Ferdinando Pallasciano, ex-*Koenig Albert*	10,643	
Pessaro, ex-*Moltke*	12,235	
		22,878
ROYAL MAIL		
Ohio, ex-*Muenchen*	18,000	18,000
UNITED AMERICAN LINES		
Mount Clay, ex-*Prinz Eitel Friedrich*	8,170	
Reliance, ex-*J. H. Burchard*	19,582	
Resolute, ex-*William Oswald*	19,563	
		47,315

UNITED STATES GOVERNMENT		
Agamemnon, ex-*Kaiser Wilhelm II**	19,361	
America, ex-*Amerika*	22,622	
City of Honolulu, ex-*Friedrich der Grosse*	10,688	
City of Los Angeles, ex-*Grosser Kurfuerst*	12,642	
George Washington	23,788	
Leviathan, ex-*Vaterland*	54,281	
Mercury, ex-*Barbarossa**	10,980	
Mount Vernon, ex-*Kronprinzessin Cecilie**	18,372	
Nansemond, ex-*Pennsylvania**	13,332	
Philippines, ex-*Bulgaria**	11,440	
Pocahontas, ex-*Princess Irene**	10,352	
President Arthur, ex-*Princess Alice*	10,421	
President Fillmore, ex-*Hamburg*	10,532	
*President Grant**	18,072	
Susquehanna, ex-*Neckar*	9,835	
		256,518
WHITE STAR LINE		
Arabic, ex-*Berlin*	17,324	
Homeric, ex-*Columbus*	33,526	
Majestic, ex-*Bismarck*	56,000	
		106,850
		612,351

—*Nautical Gazette*, 22 July, 1922.

REVISED LIST OF SHIPPING BOARD'S PASSENGER LINERS.—The United States Shipping Board has given out the following revised list of new names for the so-called "state" boats and ex-German liners:

New Name	Old Name	Length—B. P.
President Van Buren	*Old North State*	502′
President Hayes	*Creole State*	502′
President Polk	*Granite State*	502′
President Monroe	*Panhandle State*	502′
President Harrison	*Wolverine State*	502′
President Adams	*Centennial State*	502′
President Garfield	*Blue Hen State*	502′
President Madison	*Bay State*	518′
President Roosevelt	*Peninsular State*	518′
President McKinley	*Keystone State*	518′
President Wilson	*Empire State*	518′
President Harding	*Lone Star State*	518′
President Lincoln	*Hoosier State*	518′
President Pierce	*Hawkeye State*	518′
President Taft	*Buckeye State*	518′
President Grant	*Pine Tree State*	518′
Pan America	*Palmetto State*	518′
Western World	*Nutmeg State*	518′
American Legion	*Badger State*	518′
Southern Cross	*Gopher State*	518′
President Jefferson	*Beaver State*	518′
President Cleveland	*Golden State*	518′
President Jackson	*Silver State*	518′
President Filmore	ex-*Hudson*	*
President Arthur	ex-*Princess Matoika*	*
City of Los Angeles	ex-*Aeolus*	*
City of Honolulu	ex-*Huron*	*

*Ex-German.

—*Nautical Gazette*, 15 July, 1922

GAIN IN TONNAGE FOR MONTH OF MAY.—The department of commerce's monthly summary of our foreign commerce shows that in May of this year many more American vessels cleared from American ports in the foreign trade than in May, 1921, while the tonnage of foreign vessels in similar trades showed a sharp decline. The exact figures are set forth in the following table:

	American Net Tons	Foreign Net Tons
May 1921	2,113,881	2,910,341
May 1922	2,621,206	2,553,505

It will be seen that the total amount of tonnage both American and foreign is approximately the same in both months, therefore no marked increase in the volume of trade has been recorded. It will also be observed that the American tonnage was increased by an amount almost equivalent to that lost by foreign countries. Therefore the explanation lies in the fact that American ships were able to capture business from foreign ships. This means that American competition is proving effective and that our flag is becoming more firmly established on the seven seas. Herein lies reason for hopefulness and gratification for it means that the shipping board is not spending money in vain. It is admitted that the cost of the American merchant marine is a heavy Government expense, but if, as these figures show, the desired end, that of establishing our mercantile fleet in world trade, is attained, then the cost is justified.

In analizing these statistics it must be borne in mind that conditions are far from normal, and that these satisfactory results are in a large measure due to the fact that the major portion of our merchant marine is government owned. The trade of the world is still in a state of depression and foreign ships find it difficult to operate profitably. These ships, however, are almost entirely privately owned, and the owners are not financially able to bear the losses arising from operation. Hence, numbers of foreign ships have been laid up.

On the other hand the American mercantile fleet is largely government owned, and the vessels are kept on their routes in spite of heavy operating losses. In the operation of its tonnage the shipping board is losing in the neighborhood of $3,000,000 per month, an amount which no private concern could bear. Therefore a larger proportion of foreign trade is coming to American ships, and although money is being lost, the fact remains that our merchant marine is gradually being built up and our competition is being keenly felt. In other words, American vessels have recaptured the lead from foreign ships as regards tonnage employed in the foreign trade out of American ports which they held in the fiscal year 1919-20. This should give a good impetus to the future development of our mercantile fleet.—*The Nautical Gazette*, 29 July, 1922.

U. S. PASSENGER SHIPS IN TRANSATLANTIC TRADE.—When the war broke out there were only six passenger steamers of 70,372 tons flying the Stars and Stripes plying to Europe. These were the *St. Paul, St. Louis, New York* and *Philadelphia* of the American Line and the *Kroonland* and the *Finland* of the Red Star Line. At present there are 26 American flag steamers engaged in the transportation of passengers between this port and Europe. Their names, tonnage and the number of passengers which they can accommodate are shown in the following table:

	Gross Tons	Number Passengers
UNITED STATES LINES		
George Washington	23,788	2,168
America	21,144	2,668
President Harding	14,187	500
President Roosevelt	14,187	490
President Adams	10,558	683
President Van Buren	10,533	156
President Polk	10,533	152
President Garfield	10,558	78
President Monroe	10,533	78
President Arthur	10,421	1,727
Susquehanna	9,959	1,366
	146,401	10,060

UNITED AMERICAN LINES		
Mount Clay	8,170	1,433
Mount Carroll	7,469	1,272
Mount Clinton	7,509	1,278
Reliance	16,191	1,095
Resolute	17,299	1,200
	56,638	6,278
AMERICAN LINE		
St. Paul	10,230	988
Manchuria	13,638	1,698
Mongolia	13,638	1,795
Minnekahda	17,281	2,150
	54,787	6,731
RED STAR LINE		
Kroonland	12,241	1,331
Finland	12,222	1,396
	24,463	2,727
NEW YORK & NAPLES S. S. CO.		
Philadelphia	10,232	1,340
AMERICAN BLACK SEA LINE		
Acropolis	5,083	740

—*The Nautical Gazette*, 22 July, 1922.

WORLD'S SHIPBUILDING NOT UP TO TOTAL REACHED BEFORE WAR.—World shipbuilding today is actually below the pre-war level, says a statement just issued by Lloyd's register of shipping. The decrease in production has been steady since the fall of 1919, and the volume of new orders continues to be far below the completion of orders in hand.

While the returns for the quarter ended July 1 show that the aggregate of contracts in hand is nearly 800,000 gross tons more than the total of work have been directed by those who placed the orders that the actual volume of construction actively under way is slightly below the pre-war figure.

The actual construction under way at present, as compared with that just before the war, is given below:

	July 1, 1914 Gross tons	July 1, 1922 Gross tons
United Kingdom	1,722,000	1,438,504
United States	148,000	150,623
Other countries	626,000	875,303
World total	2,496,000	2,464,430

The gross aggregate of tonnage on July 1, as compared with the previous quarter, was as follows:

	July 1	April 1
United States	150,623	136,266
United Kingdom	1,919,504	2,235,998
Other countries	1,165,303	1,307,358
World total	3,235,430	3,679,622

Stoppages ordered on this work fell more heavily on British shipyards than on those of all the other maritime nations combined. This is shown in the following table:

	Britain Gross tons	Others Gross tons
Work contracted	1,919,504	1,315,926
Less suspensions	481,000	290,000
Actual work	1,438,504	1,025,926

Although there has been a sharp shrinkage in the gross aggregate of tonnage in hand during the past three months, the total for the shipyards of the United States shows a small gain. On April 1, the American aggregate was lower than before the war, but on July 1 it was slightly above the pre-war figure. This country, however, was practically the only one in the world to show a gain during the past quarter.

The world construction now actually under way shows a decline of nearly 5,600,000 gross tons from the peak, which was attained in September, 1919, when 8,048,000 tons were being built. This country's present total of 150,000 tons, compared with the high level of 4,186,000 tons reached in the first quarter of 1919, shows a decrease of more than 95 per cent. It is interesting to note that the relative proportions of the world's shipbuilding have changed considerably since the pre-war period. Great Britain, which then had 69 per cent of the total, now has only 58 per cent; the United States has still its 6 per cent as in 1914; and the other countries have increased their share from 25 per cent to 36 per cent.

Declines continue to be shown in the returns covering the construction of tankers throughout the world, but more than 500,000 gross tons of this type of vessel are still under construction. The decrease since the first of this year is shown in the following table (figures in gross tons):

	Jan. 1	July 1
United States	103,000	60,880
United Kingdom	536,000	383,221
Other countries	154,000	85,810
World total	793,000	529,911

Returns of launchings and new work for British shipyards show that the output still continues markedly in excess of the volume of new work. During the three months ending July 1 launching in the United Kingdom aggregated 148,606 gross tons, compared with work begun on new vessels which will have a total tonnage of ony 37,987 tons. A slowing down in output, however, is indicated by a comparison with the returns for the previous quarter, when launchings represented 333,000 tons, as against new work totaling 49,000 tons.

The total of work now under way in German shipyards is estimated by Lloyd's register to be 500,000 gross tons, or over 200,000 tons more than for any other country in the world except Great Britain. Danzig is reported to be building 45,000 tons of merchant ships.

Of the smaller shipbuilding countries, Italy, France and Holland still retain their lead, in the order named. All, however, show declines from their figures for the quarter ended April 1. The July 1 returns for these countries compare with the April figures as follows (in gross tons):

	July 1	April 1
Italy	285,671	311,888
France	243,290	286,255
Holland	226,318	258,240
Japan	115,512	117,312
British Dominions	49,960	63,502

—*The Nautical Gazette*, 15 July, 1922.

ENGINEERING

THE NEW SHIP CRANE FOR THE NAVY.—The navy has recently awarded a contract for the construction of a two hundred and fifty ton revolving crane mounted on the hull of the United States battleship *Kearsarge*.

The crane will be so constructed that the crane-ship will be seaworthy, as it is the intention to transport the ship, under its own power, with turrets and guns on board, to any port where the crane service is required. This will be the largest sea-going crane ever constructed.

Preparatory to the mounting of the crane, the guns, turrets, and armor will be removed, and a circular steel foundation, sixty feet in diameter, will be constructed on the deck. To this foundation, the rails for the rotating structure will be secured; for the crane will be of the rotary, hinged jib type. Bulges will also be constructed along each side of the present hull of the *Kearsarge* to produce additional transverse stability, making a total beam of ninety-two feet.

The crane proper will consist of a rotating platform to which the jib will be hinged. The jib will be an enormous structure, even in itself, for it is required to handle its maximum loads at far reaches and great heights. Two main hoist blocks, each having a capacity of one hundred and twenty-five tons, will be suspended from the jib, side by side, from sheaves fixed in the structure. A forty-ton auxiliary block will be suspended from a trolley which travels lengthwise of the jib between the main hoists.

An equalizer, with a single hook, will be used to connect the main hoist blocks together when handling the maximum load of two hundred and fifty tons.

The jib will be capable of luffing, in a vertical plane, about its hinge pins, this motion being obtained by two massive screws which operate nuts attached to the elbow of the jib and to a steel back frame built up at the back of the rotating platform. The range of these screws is sufficient so that the jib may be luffed to all working positions and also to a position approximately horizontal, when its outer end will rest in a cradle, provided at the after end of the ship for this sea-going or transport position. After the jib has been lowered into the cradle, the entire rotating structure is locked by means of motor operated wedges, to prevent rotation. A special device will also be arranged so that the screws can be slacked off to allow the jib to rest securely in the cradle.

The rotating platform will rotate about a central pivot located within the circular foundation. A system of equalized trucks, attached to the platform, will travel on heavy rails attached to the foundation. There will be four rings of these rails, located in pairs, four feet apart and having a mean diameter of sixty feet.

Intermediate between the rails a bevel gear ring will be attached to the foundation, and meshing with this gear will be two bevel pinions which will be connected to separate driving motors on the rotating platform. These pinions will be diametrically opposite at each side of the platform so that deflections in the structure under load will not affect the mesh of the teeth.

All of the hoisting and rotating machinery will be carried on the rotating platform, ropes from the drums being led around deflecting sheaves in the back frame and thence to the hoist sheaves in the jib.

The various functions of the crane will be controlled from an operating tower located at the right side of the jib, on the rotating platform. From this station, high above the deck, the operator will hoist or lower the loads hanging on the hook blocks, move the auxiliary trolley in or out on the jib, luff the jib or down, or rotate the entire crane. There is no manual labor connected with these operations. All of the motors

are governed by automatic control and the operator is reuired only to turn the small handles of his master controllers to make the giant do his bidding.

The back of the rotating platform will be counterweighted to compensate for the eccentricity of the extreme weights which the crane will handle. For this purpose it is proposed to use about four hundred tons of the old armor plate removed from the ship. This will first be placed in position and then imbedded in concrete to secure it in place.

For the operation of the various functions of the crane, direct current at two hundred and twenty volts will be supplied by a generating plant to be installed in the ship. Leads from this generator will pass through the center pin and terminate in contact rings from which the current will be collected by sliding contact shoes.

Each of the main hoist blocks will handle a load of one hundred and twenty-five tons at a radius of one hundred and one feet and, when connected by the equalizer, the maximum load of two hundred and fifty tons at the same radius has a vertical range from forty feet below the deck to one hundred and three feet above the deck. The minimum radius of the main hoist, with the jib in its highest position, will be seventy-two feet.

The auxiliary hoist will have a capacity of forty tons with a maximum reach of one hundred and seventy-four feet horizontally. At a radius of one hundred and fourteen feet the vertical range will be from forty feet below to one hundred and thirty-five feet above the crane foundation. This hoist will operate at full load with the jib in any position.

It is interesting to note that the outer end of the jib, when in its highest position, is about one hundred and ninety feet above the water, and with the jib in its lowest position the extreme end is one hundred and two feet beyond the side of the ship.

Identical motors will be used for all operations of the crane. They will be of enclosed mill type, series wound and will have a rating of one hundred and ten horse power for one-half hour. Eight of these motors forming the power equipment of the crane, will be distributed; one to each of the main hoists, one to the auxiliary hoist, one to the auxiliary trolley, two to the rotating, and two to the luffing mechanisms. An electrically operated disk brake will be applied to each motor, so arranged as to set when the current is cut off. Flexible couplings will be used to connect the motors to their pinions.—*The Tech Engineering News,* June, 1922.

REVIEW OF BRITISH NAVAL ENGINEERING.—The fifteen years under review constitute an important landmark in naval engineering from more than one aspect. The steam turbine had, in 1906, with the completion of H. M.S. *Dreadnaught,* established itself as a reliable prime mover for the largest warships, and in the adaptability of this type of engine to develop large powers a new era had developed. The naval engineers were very proud of the large powers of 15,000 i.h.p. per shaft obtained in the cruisers of the *Good Hope* class with reciprocating engines, but experience with such large engines had only too plainly indicated that this type of steam engine was approaching the possible limits in size and power that could be relied upon to give uniformly satisfactory results from all points of view. The steam turbine opened up a new field, and rapid advances began at once to be made.

Already, in 1907, warship machinery of 41,000 s.h.p. were under construction, and in 1909 the design of the *Lion* class of battle cruisers, the machinery of which developed over 70,000 s.h.p., was put in hand. This increase of more than 100 per cent (compared with the highest powers on service prior to 1907) in the total power installed in one vessel in a

period of a few years is noteworthy. It was hardly foreseen at the time of their construction that these vessels would form the striking arm of the grand fleet some years later, commencing in 1914, and the fact that these vessels performed brilliant service in this capacity and proved themselves superior in speed and maintenance of power as compared with vessels of a similar class, of later date and under more adverse conditions, shows that the difficulties attending the installation of such large powers had been accurately foreseen and overcome.

Concurrently with the design of larger relative powers in other classes of ships, active development had proceeded in the navy in the use of oil fuel. The practical difficulties attending the satisfactory burning and application of this fuel have been overcome by the zeal and ability of naval engineers. The actual application to vessels on a large scale was, however, in 1907 and for some years, limited owing to the dependence of this country on overseas supplies. This problem of course still remains. It undoubtedly gave a deal of anxiety during the war, but measures had been taken to cope with the exigencies of such a situation as far as could possibly be foreseen. With the coal-burning installations it was very early realized that the large powers possible with the turbine were tending to be restricted in warships by the large weight and space in the ships necessitated by boilers in which coal was the principal fuel. The purely oil-fired boilers were therefore fitted for some years in torpedo-boat destroyer craft only, as in these vessels considerations of high power with minimum of weight and space occupied, were of the greatest importance. The experience in this class of vessel, commencing with the *Tribal* type which began their trials in 1907, was however sufficient to establish definitely the enormous superiorities of this type of fuel for other classes and, but for the supply difficulty, it is certain that we should not have waited till 1912 before its application to capital ships. In this year the battleships of the *Queen Elizabeth* class were designed in which this fuel alone is used. The power in these ships is 75,000 s.h.p., as compared with 23,000 in the *Dreadnaught* designed some seven years earlier. It must not be overlooked, however, that general developments had permitted the design of the large battle cruiser *Tiger*, with oil still as an auxiliary fuel, and in which 108,000 h.p. was developed. This vessel, with the exception of the 70,000 h.p. cruisers of the *Hawkins* class, was the last of the high-speed warships to be fitted for coal-burning and the whole of the battleships, battle cruisers, light cruisers and torpedo-boat destroyers in the post war fleet are oil-driven, with the exception of the cruisers referred to, and in which for special reasons coal-burning generators in one boiler room were retained. In the design stage of the most modern battleships in commission, viz., the *Royal Soverign* class, coal and oil were both arranged for, but this was changed before construction had advanced.

In 1910, Sir Charles Parsons, who had been experimenting for some years to solve the problem of the adaption of the high-speed turbines for low-speed ships, fitted the first set of mechanical reduction gearing in the cargo steamer *Vespasian*, and those in control of the engineering policy of the navy at once saw the possibilities of such reduction gearing, even for high-speed ships, and, taking a very bold step which, as events showed, was fully justified, very early adapted it for powers up to 11,000 h.p. per shaft in torpedo-boat destroyers, and up to 20,000 s.h.p. per shaft in light cruisers.

During the period of the great war those at the head of the engineering department of the fleet had necessarily to cope with a situation of great difficulty, and often under unfavorable conditions. With the large war programs developed, accompanied as they were by acute questions in relation to *personnel*, shortage of supplies and the maintenance of the

sea-going fleets in efficient condition, the greatest courage, resourcefulness and ability, coupled with ripe experience and mature judgment had necessarily to be exercised. This period was one of unexampled strain, and the fact that the machinery of the vessels of the navy, which was subjected to wear and tear far exceeding anything ever anticipated, come successfully through this period, says much for the work of the officers, upon whom devolved the higher technical responsibilities. Mechanical gearing, which had hardly passed the experimental stage, became a necessity if best possible results were to be obtained in the circumstances, but again the foresight given to its application enabled it to be developed for powers not thought possible at the time, and as a culmination it was eventually applied up to 36,000 s.h.p. per shaft in the battle cruiser *Hood* and three other vessels, which latter, however, were not completed. The power in the large destroyers of the flotilla leader type rose to a total of 44,000 s.h.p. with this type of machinery.

Quite apart from a genearl increase in powers and the problems of building on a large scale, the period called for the design of novel types of vessels, which in many cases presented special engineering difficulties. As a particular case, may be cited the large and fast steam submarines of the *K* class. During this period the application of the heavy oil internal-combustion engine for much higher powers than had previously been contemplated, called for serious consideration, and although presenting great difficulties for naval work owing to the weight of these engines, progress has been made, and is still being made, in certain directions in their application other than in submarines. That this engine has never been seriously neglected by the navy as some critics may at times imply, is made evident in Sir George Goodwin's paper in the development of Diesel engines for naval purposes, recently read before the Institution of Shipbuilders and Engineers of Scotland, and which we printed in full in a recent issue (page 535 ante). The light speed internal-combustion engine has also been successfully adapted for naval use in the vessels of the coastal motor-boat type.

In one direction we have seen the adoption for large powers of the turbo-electric system of propulsion in the large vessels of the United States navy, the merits of which have to be seriously considered in this country. The internal-combustion engine makes rapid strides in the commercial world, and presents an ever more interesting problem as regards its adaptability for warships which only energetic experiment and research will solve. The possibilities of developing the internal-combustion turbine have also to be borne in mind. Under previous *regime* and during the war, it was made apparent that the navy had its own special difficulties to solve, and the admiralty engineering laboratory was established in 1917, and is still an active concern in which new developments mainly in connection with the high-speed internal-combustion engines are being tested.—*Engineering,* 19 May, 1922.

DOUBLE-ACTING DIESEL ENGINE.—The North British Diesel Engine Works is experimenting with a double-acting Diesel engine which represents a novel departure from normal practice. The engine has a sliding cylinder in which the double-ended piston moves. The motion of the cylinder is obtained from a crank driven from a lay shaft and the cooling of the cylinder jacket is effected by means of flexible pipes.

There are two sets of exhaust ports placed centrally with scavenging ports at the top and bottom of the moving cylinders. Periodically during the reciprocating motion of the cylinder, the scavenging ports register with the manifold which is connected to the scavenging air supply. In this way scaveng valves are eliminated and the exhaust valves are similarly dispensed with.—*The Nautical Gazette,* 15 July, 1922.

FOETTINGER HYDRAULIC TRANSFORMERS ON "EMPRESS OF AUSTRALIA."—The first large ocean-going liner to be fitted with Foettinger transformers is the Canadian Pacific steamer *Empress of Australia*. While the transformers of this type already in service are not as efficient as toothed gearing, they possess certain compensating advantages such as their small size, small weight and comparatively large astern power. Engineers will therefore watch the new liner's performance with interest.

The vessel's propelling machinery is divided into two units, each consisting of a high speed turbine driving a Foettinger hydraulic transformer, which transmits the power developed by the turbine to the propeller shaft at a reduced speed. Each turbine has a rating of 7,250 s.h.p. with a speed of 800 r.p.m. The propeller shaft turns at a speed of 160 r.p.m. which corresponds to a reduction of 5:1.

According to *The Engineer* the transformer performs its maneuvering functions as follows: The transformer consists essentially of an ahead and an astern circuit, each of which is furnished with a primary wheel, guide blade and a secondary wheel. As the direction of the ship varies, one of the other of these circuits is filled with water by the transformer pump, the water outlet and inlet being contracted by piston valves operated by a steam reversing engine.—*The Nautical Gazette*, 29 July, 1922.

EXTINGUISHING ELECTRICAL FIRES.—Carbon-tetrachloride, either in the commercial form or the material known under the trade name of pyrene, has been used to a considerable extent by power-plant operators for extinguishing electrical fires. This type of extinguisher is the only one known that does not involve serious hazards of shock to the operator who might attempt to use it on electrical fire. Undoubtedly, the recent newspaper reports that a large number of passengers had been overcome in the New York subway by gas generated from carbon-tetrachloride used to put out a fire resulting from a short-circuit in a switchbox caused many power-plant operators to wonder as to the real danger of using this material as a fire-extinguishing medium.

A subsequent report by General Lincoln C. Andrews, chief executive officer of the transit commission, recommends the continuance of the use of pyrene extinguishers in the subways of New York City. The report points out that "There is no evidence that poisonous gas was generated through the application of carbon-tetrachloride. Smoke and fumes generated by the fire resulted principally from burning insulation, paint and other substances. The vapor and fumes from the carbon-tetrachloride were so diluted because of ventilation or drafts about the fire as to be negligible. A thorough search for a suitable substitute for carbon-tetrachloride as a fire extinguisher in similar circumstances has yet disclosed none as good or better."—*Power*, 1 August, 1922.

FOAMITE FIREFOAM PROTECTION FOR THE S/S "LEVIATHAN."—The contract for the fire entinguishing equipment for the *Leviathan* has been awarded to Chas. Cory & Son, Inc.

This installation contemplates the complete protection of the boiler compartments, fuel oil pump rooms and filling stations of this vast ship which is now being reconditioned for the U. S. Shipping Board by the Newport News Shipbuilding and Dry Dock Company.

A most careful survey of all points where oil might collect in the bilges, on tank tops, floor plates and furnace fronts was made by the engineers and means of distributing the Firefoam provided.

In inaccessible pockets under the floor plates of the boiler rooms permanent distributors are fed from the Firefoam supply, and points above the fireroom floor are reached by conveniently located hose stations and hand extinguishers.

An all important feature of this system is, should a fire become so intense that manually operated apparatus could not be used, the Foamite is supplied to the fixed distributors and continues to flow over the burning oil even when every man is driven from the compartment by heat, smoke and nauseous gases arising from the fire. The chemicals forming the fire smothering foam are led from storage tanks and forced by pumps located at a remote point far from the fire risk, and the valves controlling the flow of chemicals are also operated by remote control out of reach of the fire.

The amount of foam which each distributor and hose station will discharge in a given time is accurately known by long experience in this special line of work, and storage capacity of the chemicals forming the Firefoam is provided to cover the entire exposed surface to be protected to a depth of twelve inches.

This effectively smothers any fire as the foam flows over the burning oil and also prevents reignition, which latter is of vast importance.

When the fire is completely extinguished the Foamite Firefoam is readily washed down by a water jet and no damage is done to the parts exposed.

The usual plant consists of two tanks of equal capacity, one containing a solution of bicarbonate of soda and a special foam producing element known as *Foamite.* The other tank is filled with aluminum sulphate. This latter material attacks iron or steel, and this tank is therefore lined with lead.

Leading from each tank is a pipe. These pipes are run separately to the point where the solutions are designed to discharge either into the patented fixed distributors or to Siamese connections into hose lines.

The pipe carrying the sulphate of aluminum, and all its valves, fittings and connections, are specially lead lined. The other line and its fittings are of iron or steel.

The two fluids come together in the mixing chambers, or distributors, and a chemical reaction produces carbonic acid gas, which as it is formed, is held in bubble form by the *Foamite* and the resultant foam, which is eight times the volume of the two fluids, is of such a nature that the fiercest fire will not break down the structure of the bubbles, and it flows over the burning surface completely excluding the air and smothering the flame, thus reducing its temperature until combustion is impossible.

—Contributed.

AERONAUTICS

NAVY TESTS OF TORPEDO PLANES.—Daily test flights with various types of torpedo planes which embody the most advanced ideas of foreign and American builders, are being held under the direction of the foremost authorities on naval aircraft design at the naval air station, Anacostia, D. C., and the next few weeks should give to naval aviation the best torpedo planes in the world.

A. H. G. Fokker, designer and builder of the famous Fokker monoplane used by Germany during the World War for pursuit and combat work is now at Anacostia. He is directing the tests of his own plane, which is an adaptation of the German Fokker pursuit machine. In competition with the Fokker planes are types of British and American design, and with the rigid tests under way each type is being judged on its merits.

With the completion of present tests, maneuvers with the fleet will be conducted which will accurately represent conditions in naval battles of the future, when torpedoes launched from aircraft at a battlefleet will be perhaps the most formidable attack to be met or rather avoided if possible.

The present torpedo plane development by naval aviation in this country is the result of hearings by the general board of the navy conducted

along comprehensive and exhaustive lines to determine the vital requirements for torpedo work from aircraft. When opinions of leaders in naval aviation had been heard and digested, and the bureaus of ordnance, construction and repair, and engineering had been consulted, specifications embodying the characteristics of the best torpedo plane to meet all requirements of service were drawn up and contracts with five aircraft manufacturing concerns were drafted and signed. It was understood the British air ministry had in use a satisfactory type of torpedo plane, the Blackburn *Swift,* and the manufacture of one of these planes was contracted for. Mr. Fokker was called into consultation and asked to embody the specifications for a torpedo plane in the existing design of his combat plane, and three American manufacturers worked simultaneously on the problem.

The Curtiss Aeroplane and Motor Corp. constructed a plane known as the *CT*—a biplane having twin 400 hp. engines. The *CT* has recently been subjected to trials and tests at Rockaway, L. I., and will not be tested further for the present at Anacostia. The Stout Engine Laboratories of Detroit constructed an unbraced monoplane having a wing structure of duralumin metal sheeting and twin 300 hp. Packard engines. The Davis Douglas Co. of Los Angeles developed a biplane, types *DT*, having a single Liberty engine. The Davis Douglas plane had a series of successful trials at the naval air station, San Diego, Cal., before the trials now in progress at Anacostia.

The Fokker is a large monoplane and carries a single Liberty engine. Before its arrival in this country for the competitive tests the Fokker was flown in test flights before Lieutenant Commander N. H. White, U. S. N., in Amsterdam.

The British plane was also subjected to trials before being brought to this country. These trials were conducted by the manufacturers in the presence of the American naval attaché in London.

The foregoing illustrates the care that was taken to insure an assembly of the very best types of aircraft in the world suitable to torpedo work. Aid of the foremost international talent was first enlisted, and by elimination, five types of torpedo planes secured. Finally the rigid competitive tests at Anacostia were inaugurated.—*Aviation,* 24 July, 1922.

NEW COMBAT PLANES DESIGNED FOR NAVY.—Washington, July 22.—A new type of seaplane, called the *"TS"* and designed to meet the requirements of combat and pursuit in connection with fleet operations, has been designed and developed by the naval bureau of aeronautics and is undergoing tests at the Anacostia naval air station. Naval experts said today that the new type had characteristics for combat work equal to those of any combat plane in use by military service and is, besides, adaptable to ship use.

The seaplane was built at the naval aircraft factory in Philadelphia. Another machine of the same type has been completed by the Curtiss Company and will soon be tested at Anacostia.

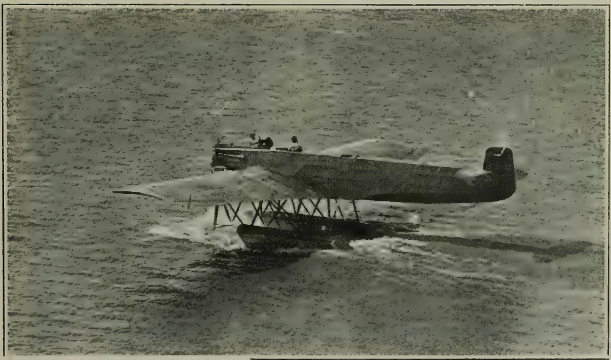
The function of the combat plane is to protect aircraft by destroying or dispersing enemy aircraft. Great radius of action, small dimensions, speed, adaptation for handling or stowage on shipboard, superior maneuvrability and stability, along with light but rugged construction, are the qualities sought.

In the tests at Anacostia the *TS* showed all these qualities in a manner extremely satisfactory to government experts who say it is the equal of any craft of its kind in standard use.

The seaplane is equipped with a Lawrence 200 horsepower air-cooled motor. Speedy assembling and disassembling of the craft is possible. The struts, connecting the upper and lower wings are secured by pins, which

Official Photograph, U. S. Navy

DOUGLAS DAVIS TORPEDO PLANE



Official Photograph, U. S. Navy

FOKKER TORPEDO PLANE

are easily withdrawn, so that the plane can be disassembled quickly and carried in small space. Two types of landing gear are provided—wheels for landing on ship's deck or land and pontoons for landing on the water. —*New York Times*, 23 July, 1922.

F5L's IN LONG SQUADRON CRUISE.—The safe arrival of twelve *F5L* seaplanes which flew from Philadelphia, Pa., to Pensacola, Fla., has just been reported to the bureau of aeronautics of the Navy Department by the naval air station at Pensacola.

This flight of twelve large scout planes over a distance of approximately 1,000 miles without mishap of any kind is a high tribute to the efficiency and reliability of material and personnel and demonstrates conclusively the mobile qualities of naval aviation units.—*Aviation*, 17 July, 1922.

BUILDING BIG HELIUM AIRSHIP.—The first large-sized semi-rigid airship of all-American design is now being constructed at Akron, Ohio. This will also be the first American floating aerial base and airplane-carrier. This ship will be used experimentally to develop the lighter-than-air machine as a fuel-saving, long-distance carrier and mother ship to airplanes that will take off from and attach themselves to it in the air, according to Major P. E. Van Nostrand, in charge of the balloon section, United States army air service here.

The new craft will have a capacity of from 70,000 to 750,000 cubic feet of gas and will be something less than 400 feet long and will be propelled by four 12-cylinder Liberty motors able to drive the airship at the rate of 70 miles an hour. It will be able to carry two or three airplanes, but experiments will be begun with the use of one plane of small type which will be carried underneath the ship and launched from that position. By merely throttling down the speed of the plane, it will be able to fly underneath and hook on to the mother ship. Airships large enough to carry from five to fifty planes may be developed as a result of these experiments.

"Leaving and returning during flight is a simple matter," Major Van Nostrand claims. "As long as the airplane stays in its natural element there is little chance of trouble. It will furnish a safer method than that of the hydroplane lighting on rolling ships around which there are frequently treacherous air currents and will be much superior to present ground landings.

The new airship is especially designed for helium gas which has about eight per cent less lifting power than flammable hydrogen heretofore used. On account of this the bag must have a larger capacity to raise the same amount of dead weight. Helium gas is also too scarce and valuable to be released to regulate the altitude of the craft. In the ordinary hydrogen balloon and airship when it is desired to go higher ballast is thrown out and when necessary to descend gas is let out. In the new helium aircraft, the necessity of valving or throwing out ballast is partly compensated for by cooling or heating the helium and thus causing it to contract or expand as desired.

Using the gasoline fuel during a long trip would ordinarily lighten the ship and cause it to rise. But loss of weight in fuel is compensated for by collecting the water in the exhaust gases formed by the hydrogen in the gasoline combining with the oxygen of the air in the engines. For one hundred pounds of gasoline used there is about one hundred pounds of water produced and the weight approximately equalized.—*Boston Evening Transcript*, 17 July, 1922.

LANDING PLATFORMS PERFECTED FOR NAVY PLANES.—On July 19 the Navy Department announced the perfection of a landing device whereby

speeding planes are brought to stop on a wooden platform, 100x10 feet. The method of effecting a landing within the confined limits of the wooden platform is described as one of the most expert performances that the flying art has achieved. The plane, sweeping low and traveling at the speed of the fastest express train, is landed by the pilot close to the edge of the platform, whereupon a hook suspended from the bottom of the plane engages the transverse wires on the deck. The successive wires are picked up and the increasing amount of weight attached to the wires exerts a brake effect on the speed of the plane, which thereby is brought to rest within a distance measured in feet.—*Army and Navy Journal*, 22 July, 1922.

New Wright Engines for Naval Aviation.—The Navy Department has in a quiet way done a considerable amount of development work on aircraft engines during the past two years. An interesting evidence of this is the recent completion of test of 250 hr. on a Wright E2 engine. This engine was run for two periods of 125 hr. each. One hundred and twenty-five hour runs were continuous, 24 hr. a day, the only stops being three in each period due to gasoline shut off, trouble with oil radiator leakage, spark plug renewal and the necessity for club renewal, as part of the test was conducted in a rainy period.

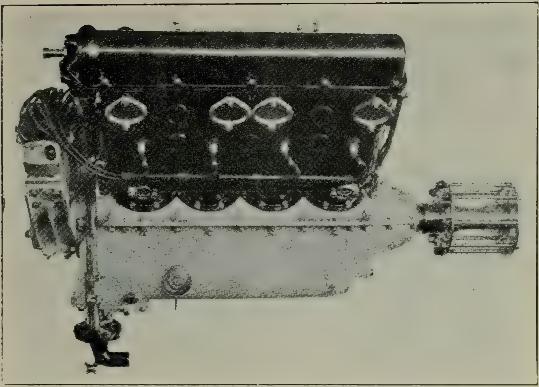
This engine was run at a rated horsepower of 180, and a rated speed of 1,800 r.p.m. on straight aviation gasoline. While the results of the test are not for publication as yet, it is understood that the Navy Department is well pleased with the tremendous durability shown by the engine and it is also understood that the Wright Company intends to incorporate in future production engines several modifications of the standard E2 which were tried out during this test.

Another result of the encouragement by the naval bureau of aeronautics of independent development of aircraft engines is the development by the Wright Aeronautical Corp. of a new 12-cylinder engine, known as Model T2. This engine was designed to meet the Navy Department requirements, and has been built on Navy Department orders. It is designed for heavy-duty naval seaplanes, whose long flights require great durability, and on account of the weight of gasoline necessary, the engine had to be as economical as possible. Notwithstanding these primary considerations, this engine, as developed, seems to have a wide range of application, owing to its low weight per horsepower.—*Aviation*, 31 July, 1922.

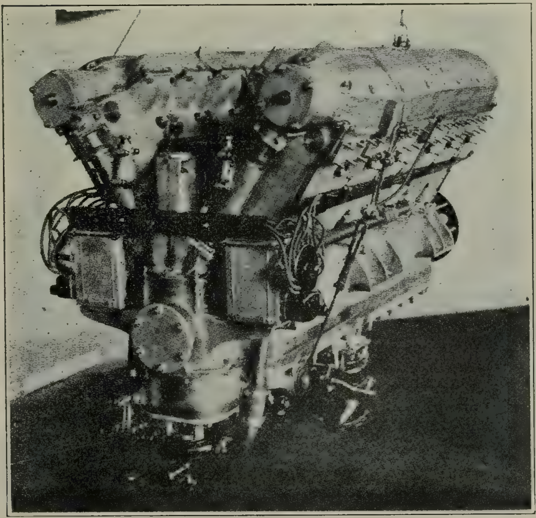
British Aircraft in Fleet Exercises.—Mr. Amery (to Captain Viscount Curzon): Aircraft have taken part in various exercises carried out by the fleet this year, whenever the weather has permitted of them doing so. Their work has consisted mainly of reconnaissance, the exercise of torpedo plane attacks and spotting. In addition a certain amount of experimental work has been carried out.

Numbers of British Naval Aircraft.—Mr. Amery (to Captain Viscount Curzon): The aircraft (apart from reserves) allotted for working with the fleet from ships and carriers are as follows:—18 reconnaissance planes, 6 fighters, 12 torpedo planes, 18 spotting planes. The personnel available is sufficient to man these aircraft.—*Army, Navy, and Air Force Gazette*, 22 July, 1922.

Royal Air Pageant.—The R. A. F. aerial pageant, which was held successfully at Hendon on Saturday last, was of special interest, not alone on account of the spectacular display, but also because four new types of machines designed for naval and military purposes were shown for the first time. These machines included two of the very latest craft for naval



WRIGHT MODEL E2 180 H.P. ENGINE WHICH RECENTLY MADE A 250 HR. TEST RUN FOR THE NAVY DEPARTMENT



WRIGHT MODEL T2 500 H.P. ENGINE BUILT FOR HEAVY DUTY NAVAL SEAPLANES TO THE ORDER OF THE NAVY DEPARTMENT

service, a third was a special high-power single-engined plane for long-range bombing duties over land, and the fourth a fast aeroplane for fighting and army reconnaissance. The Blackburn *Dart* torpedo carrier is specially designed for carrying out torpedo attacks on warships, the torpedo being accommodated beneath the fuselage, which is of special shape, giving the pilot a wide range of vision over the sea. The second naval type is the *Seagull,* an amphibian of the flying-boat type, with wheels which may be raised and lowered by the pilot. The ability of this machine to alight either on land or water forms a valuable asset for naval reconnaissance duties. The new *Aldershot* aeroplane, the long-range bombing machine, has a double deck, the two decks being connected by a ladder on the interior of the fuselage.—*The Engineer,* 30 June, 1922.

TORPEDOES FROM THE AIR.—The Blackburn *Dart,* the new torpedo-carrier aeroplane, may quite possibly revolutionize naval warfare, writes a correspondent. At a recent trial off the Isle of Wight, in which three *Darts* took part, they each registered a hit. The whole point about the *Dart* attack, I was told by an expert, is the tremendous speed with which it is carried out. The Isle of Wight attack lasted less than one minute, but in that time the deadly work was accomplished. Each *Dart* carries one torpedo weighing about 1,400 pounds, and in action they work under the protection of armed scouts.

The method of attack is quite simple. The *Dart* descends and fires the torpedo when about ten feet from the water. The torpedo travels in the direction in which the plane is travelling, so that the aim may be said to be taken by the pilot. If necessary, the *Dart* can be landed in the sea, but it is not very well adapted for that. The folding wings enable it to be easily carried on the aircraft carriers of warships. The *Dart* can, when necessary, travel at less than 30 miles per hour. This ability to fly slowly will prove invaluable in action.—*The Naval and Military Record,* 28 June, 1922.

NAVIGATION AND RADIO

NEW SOUNDING DEVICE.—The destroyer *Stewart* has just finished a cruise from Newport to Gibraltar, during which a new sounding device which can be used in both deep and shallow water was given a service test. This apparatus was designed principally by Harvey C. Hayes, physicist of the naval engineering experiment station, Annapolis. Dr. Hayes made the cruise to Gibraltar aboard the *Stewart.*

The *Stewart* is the first vessel to be equipped so that a continual line of soundings can be run throughout a cruise. During her cruise to Gibraltar exhaustive tests of the sounding service were carried on and daily reports were made by radio to the Navy Department at Washington.

The radio reports show that during the whole of the cruise the apparatus worked without apparent error. The machine secured correct and rapid soundings with ease. The *Stewart* made the cruise from Newport to Gibraltar in nine days, and during this time over nine hundred soundings were taken at frequencies varying between 20 and 2 minutes. The ship's movements, while steaming steadily at 15 knots, were not interfered with except for a two-hour interval. During this two-hour period it was shown that successful soundings can be taken at intervals of one minute in the deepest water. The outline of the bottom of the sea over the course was minutely recorded between Josephine and Tysburg Bank. The sea bottom there was found to consist of an extensive plane bordered by mountain and tablelands, some of which rose 4,000 feet above the plane. Several deep depressions, none of which are shown on charts, were also discovered. Positive depth data was secured where charts show only negative data in the vicinity of the Azore Islands.

It is believed the outline of the trade routes should give any number of such landmarks for use in finding a ship's position. The exploration of all the sea floor is possible by the use of this new device, which bids fair to revolutionize piloting and navigation.

The new sounding device gives immediate measurements of depths of water so that there is no lead to heave or wire to unreel and reel in again as in other means of obtaining soundings. It is used in connection with a sound transmitter and sound receiver and depends in its operation upon the reflected echo of a signal given off by the vessel's sound transmitter being received by the same vessel's receiver.

The sound transmitter used in connection with Dr. Hayes' sounding device develops a high frequency vibration in a diaphragm which is in contact with sea water. The high pitched note carries a great many miles. The sound receiver is capable of receiving sound transmitter signals over great distances. The value of this receiving apparatus in locating light vessels and buoys equipped with sound transmitters is already known to the maritime world, though it has never before been used in connection with sounding the bottom of the sea.—*Army and Navy Register,* 15 July, 1922.

A NEW TELEPHONE INVENTION.—A demonstration was given recently in the office of the chief signal officer of the United State Army of a new telephone invention, the "Superphone," which has been developed under the direction of R. D. Duncan, Jr., chief engineer of the signal corps research laboratory, at the bureau of standards, assisted by S. Isler, assistant radio engineer.

The new device is based on the original invention, about 10 years ago, by Major General O. Squier, chief signal officer of the army of "wired wireless" or "line radio." It consists of a small portable set of instruments which may be installed in any office or residence in a few minutes and connected directly to existing telephone lines, and conversations carried on in the usual way. It will be necessary only for the subscribers to close a switch or press a button to connect in the superphone in place of the ordinary phone.

This superphone provides a means for secrecy of communication without any chance of the conversation being overheard, interrupted or broken into on the line by any one else. It is obvious that this invention will prove of value for military purposes in case of war, where secrecy in communication is absolutely necessary. It may also prove of utility for ordinary commercial purposes where important business houses, such as banks, brokers, etc., may desire to have private channels for confidential communication with their branch officers or with any business establishment, and insure secrecy of the conversations carried on.

The principles involved in this invention are those of "wired wireless" by which high-frequency alternating currents are employed which are modulated at the transmitting end by speaking into an ordinary microphone and detected at the other end by the usual radio instrumentalities which finally pass on to an ordinary telephone receiver. The speaker, however, or the listener-in, is not concerned with any of the additional instruments; they are installed and properly adjusted once for all, and the people carrying on the conversation have no more bother than in the use of the usual telephone system.

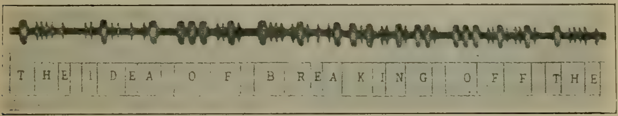
Another advantage of this method of telephone communication is that it makes multiplex telephony possible. A number of secret telephone conversations may be carried on simultaneously over the same line without interfering with each other.

The transmission of speech by the utilization of this invention is even clearer than ordinary telephonic speech.

The power required for carrying on conversations over even considerable distances is of the order of one-tenth of a watt, which is about 1/500th of the power required to light an ordinary electric lamp.—*Scientific American,* June, 1922.

RECEIVING RADIO AT 200 WORDS PER MINUTE.—The capacity of radio telegraph stations is to be increased to a considerable extent in the near future by the use of rapid methods for receiving the messages. The efforts in this direction which have been made by one of the largest French radio companies are now meeting with great success. This firm has been very active in the construction of wireless stations, one of the most recent being the great station of La Doua, at Lyons, which is now working with the United States. This station has already been described in our columns, so that we will confine our present efforts to a brief account of the methods and apparatus which are employed for recording the messages at high speeds.

The phonograph method is employed for taking down messages at speeds which are considerably above the usual rates, this speed being in all cases above 25 words per minute and may reach as high as 100 to 150 words. But it is evident that messages with the dot and dash system cannot be read at such high speeds on the telephone by the operators of the station. The phonograph can, however, be called upon to take down the messages at these rates, and by means of the new apparatus the signals are now recorded upon the phonograph without difficulty. A phonograph of the customary disk type is employed for this purpose, making necessary certain slight changes in the equipment, such as are required to adapt it to radio service, all that is necessary being to mount the receiving telephone in the place of the usual phonograph recording diaphragm, the telephone diaphragm being provided with a stylus for producing the record on the disk.



PIECE OF PHOTOGRAPHIC RECORDER TAPE CONTAINING PART OF A MESSAGE RECEIVED AT THE RATE OF 200 WORDS PER MINUTE, WITH THE TRANSCRIBED MESSAGE BELOW EACH DOT-DASH CHARACTER

It is found that the phonograph record is still quite satisfactory when the apparatus is working at 150 words per minute. When the disk has received the telegraph message, it is transferred to a second device which serves to reproduce the sounds in the usual manner, but the record type of phonograph is of a somewhat different design, and is designed to operate at slower speed in order to enable the operator to read the messages.

A still higher speed for recording wireless messages can be reached by making use of the photographic method, and by the use of improved apparatus recently brought out by the French firm it is possible to operate at speeds which can handle up to 500 words per minute. This makes it a more rapid means for receiving messages than the phonograph system, and the new photographic apparatus is not of an unduly complicated nature. Indeed, it is so designed that all the operations can be carried out in a very simple manner and by persons having no very special skill.

The photographic recorder is based on the use of a galvanometer containing a small mirror which is adapted to swing under the action of the radio impulses forming the signals, the current at the receiving end being amplified to the proper degree by the use of the usual amplifying devices. The duration and amount of the swing of the mirror will correspond to the dot and dash signals, while the mirror reflects a beam of light onto a strip of sensitive paper tape which is caused to unroll at a greater or less speed, according to circumstances. The beam of light thus traces the message on the strip. The result is that the message will appear in the form of dots and dashes, as shown in one of our illustrations, when the strip is developed by the usual photographic process. No difficulty is experienced in taking down messages at the rate of 500 words per minute. It should be remarked that such messages could not be read by a station which is not provided with the photographic receiving devices.—*Scientific American*, June, 1922.

SENATOR MARCONI'S SHORT WAVE EXPERIMENTS.—Experiments in the application of the short wave have resulted in the discovery of a new field in the science of wireless communication which when further developed will increase the safety of life and property at sea. The innovation, which was explained and demonstrated by Senator Guglielmo Marconi before the American Institute of Radio Engineers and the American Institute of Electrical Engineers, is based upon the ability to aim a wave in any chosen direction and send it straight to the receiving station for which it is intended. The unlimited possibilities of this new phase of the radio art are very apparent and it does not require too keen a prophetic vision to foresee that the discovery presages a new wireless era and that its universal application is not far off.

For his demonstration before the radio and electrical engineers Senator Marconi used a miniature wireless set, a photograph of which is shown on this page, and sent signals in loud, clear notes across twenty feet of space on a wave of only one meter. The engineers who witnessed the performance were surprised not only at the precision with which the signals were directed, but also at the perfect results achieved on so short a wave length. Illustrating the high development of which the short wave field is capable Senator Marconi stated that on waves three and a half meters in length he had sent signals nearly one hundred miles in a desired direction.

* * * * * * * *

These results were achieved by the use of a reflector apparatus for the sending of the wave which is caught at the receiving end on a horizontal metal standard. This reflector is semi-circular in shape and is covered with wires. When its open side is turned toward the receiving station the signals are strong and clear, but when turned away the signals become almost inaudible.

* * * * * * * *

"The attenuation of these short waves over sea is so surprisingly regular that a little experience enables distance to be judged by the strength of signals, and this can be measured by means of a potentiometer."

Senator Marconi said that he believed the same system could be applied to ships at sea, so that collisions would be avoided in thick weather, and it would be unncessary to send out the famous S O S call for help.

"It seems to me," he declared, "that it should be possible to design apparatus by means of which a ship could radiate or project a divergent beam of these rays in any desired direction, which rays, if coming across a metallic object, such as another steamer or ship, would be reflected

back to a receiver screened from the local transmitter on the sending ship, and thereby immediately reveal the presence and bearing of the other ship in fog or thick weather."

Trials are now being carried out by Mr. C. S. Franklin of the British Marconi Company. Describing the apparatus and its working Senator Marconi said: "The transmitter and reflector, revolving, act as a kind of wireless lighthouse or beacon, and, by means of the revolving beam of electrical radiation, it is possible for ships, when within a certain distance, to ascertain, in thick weather, the bearing and position of the lighthouse. —*The Nautical Gazette,* 1 July, 1922.

MAJOR ARMSTRONG'S NEW SUPERREGENERATOR.—The exact nature of Major Edwin H. Armstrong's new work, about which there has been so many rumors, was revealed in a paper before the Institute of Radio Engineers. The new device described and exhibited by the inventor is named by him a superregenerative receiver.

In the *New York Tribune* Jack Binns gives an enthusiastic account of the new method. We read:

"Armstrong calls his latest system the superregenerative receiver, but it is in all reality the first true radio-frequency amplifier. Its most astounding characteristic is the fact that it increases its power of amplification inversely as the square of the wave-length. Put in simpler language this means that the lower the wave-length the greater the amplification; thus if the wave-length is cut in half the incoming signal is amplified four times stronger than it would be in the first case.

"Perhaps another more forceful way of stating this is by saying that the new receiver opens up to us the lower wave-length ranges, so that in the immediate future it will be quite possible for broadcasting stations to operate on wave-lengths as low as ten meters. Now when we have broadcasts as low as that it will mean that the two stations close together can broadcast simultaneously without interference, one using a wave-length of ten meters and the other a wave-length of eleven meters.

"This is because of the fact that at those wave-lengths there is a difference in frequency between the two stations of 2,727,000 cycles a second. As it is frequency which causes interference, it will be seen how great is the margin of difference in frequency on the low wave-lengths, when a difference of one meter in wave-length makes a difference of 2,727,000 alternations a second in the electrical current.

"The wondrous possibilities of the new apparatus are obtained in the simplest manner imaginable. The terrific amplification can be obtained with two ordinary vacuum tubes connected together with inductances and condensers, but, of course, better results are obtained with three tubes, as shown in the diagrams reproduced on the following page.

"In an actual demonstration of his new apparatus before the Institute of Radio Engineers, Armstrong completely flooded the large auditorium with music and speech from Newark, eighteen miles away, although he used only a small loop about one meter diameter. This was done despite the fact that the Engineering Societies Building is a mass of steel framework thoroughly grounded.

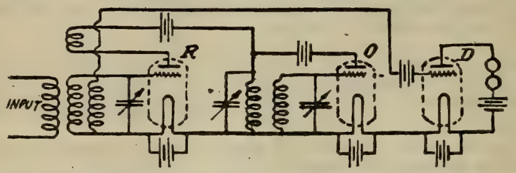
"Alongside of his demonstrating apparatus was a standard regenerative receiver with two stages of audio-frequency amplification. When this was attached to the loop aerial no one in the room could hear the music from Newark, although it could be heard faintly in the head telephones.

"One of the astounding characteristics which makes the new receiver the ideal broadcast apparatus, is its ability to completely eliminate spark signals. It wipes them out absolutely.

"In explaining this, Armstrong pointed out that the incoming spark sets up free oscillations in a regenerative circuit which continue until the

next spark comes along, and the greater part of the energy is in these free vibrations.

"In the new system these free vibrations are completely wiped out because every twenty-thousandth of a second the resistance of the circuit becomes positive and thus chops the free vibrations out before they have a chance to be built up.



From the New York "Tribune."

THE NEW ARMSTRONG SUPERREGENERATIVE CIRCUIT.

"The future possibilities of the new system are limitless. One of the most important of them is bound up in the ability of the apparatus to operate economically and efficiently upon short waves. It will be possible in the near future to utilize the receiver with the system now being developed of short-wave wireless telephony, using a reflected wave which will give the utmost degree of secrecy attainable.

"Although Armstrong has steadfastly refused to talk about any of the remarkable inventions, he did say to me yesterday during a conversation that he had succeeded in getting down to fifty-meter wave-lengths with the new system, and that this experiment had confirmed the fact that the apparatus amplified four times greater on the short waves.

"On waves of this length, using reflectors shooting a beam of waves in one direction, wireless telephone conversation has already been accomplished by Franklin in Europe over a distance of 200 miles with the older types of receivers. With Armstrong's latest receiver this distance could be greatly increased with the same amount of transmitting power.

"Despite the fact that Armstrong, who is naturally modest, is reticent about the value of his inventions, his friends have no hesitation about pointing out their value. In this connection Louis G. Paceni, a member of the institute and one of the co-workers, in discussing it with me, said:

"When we take into consideration the fact that the superregenerative system is 100,000 times more sensitive than the regenerative circuit, it is well to point out that the regenerative circuit itself is several hundred thousand times better than the ordinary circuit.

"Another important point is the fact that with a multi-stage radio-frequency amplifier it is very hard to change wave-lengths, but by using the superregenerative method the wave-length range can be very easily changed. Such a change does not require more than two adjustments, one in the secondary circuit, and the other on the feed-back or regeneration.

"With fixed inductances a wave-length range from 150 to 600 meters can be covered without difficulty or changing the inductances or capacities. In other words, you get a wave-length ratio of four to one; say, starting at 100 meters you would get 400 meters, and starting at 25 you would

get 100 meters. Of course, if the inductances are made adjustable the difference in the wave-length range can be greatly increased.

"It seems that Armstrong, in addition to giving the radio an invention which is capable of reception on short wave-lengths in a tremendously efficient manner heretofore unknown, has opened up a new field, using extreme frequencies and amplifying them without difficulty."*The Literary Digest,* 15 July, 1922.

MISCELLANEOUS

"DUNCAN" GOLD MEDAL ESSAY, 1921-22.—Deduce from the experience of war, the future of the defence of coast fortresses against attacks by land, sea, and air, during the next ten years. By Major and Battalion Lieutenant Colonel F. W. Barron, O.B.E., R.G.A.

"Si Vis Pacem, Para Bellum." In these days of financial stringency, when the cry for economy is upon the lips of every "man in the street," it is, perhaps, only to be expected that our coast fortresses should be a target for the axe of the economist; the more so, seeing that, during the whole course of the greatest war in the history of Great Britain, there is no single instance of a serious attack by the enemy of any of our great defended ports. The fact that the efficiency of the defences of those ports was, of itself, a reason for the absence of attacks, is either unknown to, or deliberately ignored by those who maintain that coast defences are nothing but a costly encumbrance. And yet these same people would hardly suggest that the Bank of England should be left unguarded, or rest confident in the protection to their houses afforded by locked doors and windows, and therefore vote for the abolition of the police. That coast defence will be necessary in the future as in the past is beyond doubt. Our problem in this paper is to consider the form which such defence must assume, and in what respects it will differ from the coast defence of pre-war days.

CHAPTER I

It is to be noted that the period of time to be covered in the forecast in this paper is to be one of ten years. Since the subject was selected, however, two important things have occurred:

(a) It has been decided by the government that a war against a civilized power may be treated as in the last degree improbable during the next ten years.

(b) At the Washington Conference we have definitely abandoned our position of maritime superiority, and have adopted a "one-power standard," which is to be maintained, again, for a period of ten years.

Consequently we are dealing with a period during which we regard war as improbable, and when, should the unexpected happen, we shall be relatively weaker than ever before, as regards our navy.

It is to be feared that the opponents of coast defence will be encouraged to even greater activity by the former factor, and will fail to observe that the existence of the latter only renders it more necessary than ever for us to ensure adequate defence for our more important naval bases and seaports.

Let us therefore consider for a moment what is the object of a coast fortress, i.e., the rôle it is intended to play in war.

It cannot be doubted that to the uninitiated, the word "fortress" only too often conveys the same meaning as the word "fort." It calls to mind an impregnable citadel such as Kronstadt, or a fortified island fastness such as Heligoland. The expression "coast fortress," however, covers an idea far more extensive than this. It is difficult, if not impossible, to

give an exact definition, but perhaps a suitable description would be: "A coast fortress is a locality containing works of defence for the purpose of repelling attack by either air, sea, or land, with the object of safeguarding some important military or civil establishments located within its perimeter." It will be seen that the definition covers every kind of defended locality, from the smallest coaling station up to an enormous area such as that of the Portsmouth defences, which includes the whole of the Isle of Wight. It will also be apparent that the definition will include not only those localities which exist as coast fortresses in time of peace, whose defences have been gradually developed, extended, or improved in conformity with the progress of scientific and mechanical knowledge, but also localities which may be converted into coast fortresses in time of war. (For examples of the latter we may point to Scapa Flow and Zeebrugge, which were converted into coast fortresses during the recent war, the former as the base for the British grand fleet and the latter as an advanced base for German submarines.)

As regards the rôle of the coast fortresses, it is merely stating a platitude to say that the only means to final success in war is to attack, and it may therefore be argued that to spend money on a purely defensive article is simply to divert that money from the more profitable purchase of instruments of offence. This is certainly true, within limits. But weapons of attack require renewal and repair, schemes of attack entail provision of food, ammunition, and a host of stores of all descriptions, and finally, the direction of attack calls for the provision of staffs, intelligence centers, and numerous establishments of personnel. And all these varying factors demand security as a condition of complete efficiency. The rôle of the coast fortress, therefore, is to provide that security for the direction of attack, and for the preparation, supply, and maintenance of the means thereto, both in personnel and material.

CHAPTER II

Pre-War Conditions

It has always been taken as an axiom that our naval forces would be able to assert superiority at sea over any combination of foreign navies which might be brought against us, and consequently that any movement of hostile fleets on a large scale would be dealt with by our navy within a short time of its commencement. In home waters this period was estimated to be not more than 48 hours. In foreign waters, however, it was clear that no estimate could be made, in view of the scattered nature of our oversea possessions.

From this followed three main conclusions:

(a) That an invasion of Great Britain by a large army with all its necessary impedimenta would certainly be impeded, if not actually prevented, by our navy, and that consequently a continuous line of defences round our coasts was not required.

(b) That it was possible, however, that individual ships or squadrons, detached from the enemy's main fleet, might be able to carry out attacks of the "tip and run" nature upon our ports, and that small raiding forces might be landed in undefended localities, and thence attack our fortresses from the land side.

(c) That immunity from attack upon our oversea ports could not be absolutely guaranteed by the navy.

It is obvious that to make our ports, home and foreign, entirely secure against attack, would have entailed the provision of local defences at each of them, and it is equally obvious that, since our resources, even in pre-war days, were not unlimited, such a course of action could not be adopted. The accepted policy, therefore, was to provide local defence for certain

areas which contained important and vulnerable objectives, and to accept the dangers incurred by leaving the less important places undefended. In order to determine the form which such defence should take, it was obviously necessary to consider the nature of attack which might be expected. In view of the probability that hostile forces attacking a defended port would almost certainly be themselves attacked by our naval forces within a few hours, it was decided that, except in a few special cases, it was unnecessary to provide for complete protection against prolonged operations. The important requirement was that the defences should be of such a nature as to act as a powerful deterrent to attack by hostile ships. At certain ports, especially many of those abroad, the minor importance of the port or the improbability of attack by heavy ships made the provision of the full scale of defence required for large fortresses unnecessary, and in other places the special probability of one or other form of attack called for modification in the means of defence. In fact, the defence of every locality had to be considered on its own merits, with due regard to the importance of the place, its distance from enemy bases, coastal and hydrographical features, etc.

Briefly, the principles on which our schemes of defence were compiled were:

(a) To keep bombarding ships at such a distance from the fortress, as to prevent serious damage to important targets lying within it.

(b) In case of home ports, to hold off an attacking enemy until our naval forces should have time to arrive and deal with him by fleet action.

(c) To prevent the entry of torpedo craft into harbors and roadsteads.

(d) To repel attempts at mine-sweeping or the removal of booms or other obstructions, and to prevent the blocking of narrow channels by enemy mine-layers or blockships.

(e) To resist attack from the land-side for a sufficient time to allow of the arrival of our own land forces.

CHAPTER III

Examples of Attack and Defence of Coast Fortresses During the Great War, and Lessons to be Learned Therefrom as to the Principles of Defence

Perhaps one of the most noticeable features of the war, in which seapower played so great a part, and in which the navies of every one of the great naval powers took part, was the paucity of instances of attack on land defences or defended areas by warships. A few of the more noticeable are as follows:

(i) *The naval bombardment of the Dardanelles*

This consisted of a deliberate attack by battleships on permanent shore defences, with a view to destroying them so completely as to allow of the entry into the defended waters of craft charged with the duty of removing minefields and other obstacles, and thus to clear a passage into the Sea of Marmora for our fleet, military transports, and various auxiliary craft. The chief lesson to be learnt from this example is that, in a direct duel between ships and forts, the odds are distinctly in favor of the forts. One lucky shot from a ship can at best demolish one gun of a fort. On the other hand one lucky shot from a fort may quite easily neutralize at least half of the guns of a ship. And moreover, owing the difference in size of the target, and the advantage accruing from the possession of a fixed and stationary platform, the prospects of accuracy of the land gun are enormously greater than those of the ship's gun. Further, the ship's

gun, being designed primarily to engage other ships, and being required to pierce a considerable thickness of armor, is necessarily of very high velocity and therefore of flat trajectory, and employs a very different type of projectile from that which is the most suitable for the attack of land defences. The flat trajectory renders it ill-suited for engaging any but direct-fire targets, and considerations of space prevent the carrying of two classes of projectile.

(ii) *The bombardment of Madras, Whitby, Scarborough, and other open or lightly-defended coast towns*

These bombardments, which were all of the "tip and run" nature, only serve to teach us the impossibility of rendering our coasts completely immune from attack. In neither case was there any great military advantage to be secured by the enemy, and in neither case did he inflict on us any damage which could have a real effect on the war as a whole. And, in one or two cases at least, the incidents went to prove the wholesome dread felt by a surface ship of coming within range of even the smallest guns of a coast battery.

(iii) *The German torpedo-boat attack on Dover*

This attack was entirely half-hearted, and was not pressed home. This was perhaps chiefly because it was made without any very definite object, but was also, no doubt, partly on account of the readiness of the defenses.

(iv) *The blocking of Zeebrugge*

This operation was in every way a model. Its success practically crippled the German submarine compaign, not merely by the loss of the use of the vessels which were shut in, but by the denying to the enemy of his advanced submarine base. It was a triumph of organization and foresight. Every possibility had been considered, every development forecasted, every element of risk eliminated as far as possible. For these reasons it succeeded completely, where every similar attempt in previous history had been either a complete or partial failure.

The operation consisted of several features: long-range bombardment of the heavy guns of the defense, short-range bombardment of the light guns, a raid on the land defences by landing-parties, attack on the boom and net defences by small craft, and finally the sinking of three large vessels in the narrow entrance of the canal, inside which was the submarine anchorage.

The chief lesson to be learned by the defence from this attack is, we think, the necessity for a high standard of training in the personnel. Two points seem to emerge from the reports to the action above all others, namely:

(a) The diversion created by the appearance of the *Vindictive* alongside the mole was indeed a diversion. It apparently caused every man of the defence to look westwards, with the result that the blockships coming from the north-east were not engaged until too late.

(b) When the *Vindictive* emerged from the smoke-screen within 100 yards of the mole battery, excitement caused the gunners to fire point-blank at her sides, instead of at her water-line. Consequently no vital damage was done. Had she been riddled on the water-line, she would possibly have been unable to close on the mole, and in any case she (and therefore her landing parties) would never have been able to get away again.

(v) *Attack on shipping at Constantinople by our submarines*

This operation, although its success had, perhaps, but a small effect on the war, teaches to the defence the useful lesson that, however thick be the mine-fields, and however many the booms or net defences, a determined submarine commander provided he has sufficient depth of water in which to maneuver, may at any time penetrate them, and hence that no material obstacle can be a substitute for vigilance in look-out duties and instant readiness for action on the part of all defence personnel. Here again we see the need for a high standard of training.

CHAPTER IV

Developments During and Since the War

The changes in methods and material during the recent war have, indeed, been immense. Perhaps the greatest development, and that which will exercise the largest influence on our future methods, has been the introduction and perfection of a new arm, i.e., the aerial figthing machine. Before we study this new arm, however, it seems advisable to consider what changes have taken place in those we knew formerly. Let us therefore look at the development of the power of attack, i.e, of naval power.

Developments in the attack

The most striking innovations are:

(i) *The increased range of guns.* Where, formerly, it was considered that a fortress would be comparatively immune from damage if hostile vessels could be prevented from closing within 15,000 yards, it is now possible for accurate bombardment to be carried out (provided that means of observation exist) at ranges up to 40,000 yards or even more.

(ii) *The increased speed of ships.* This factor increases the probability of attack, by reason of the added facility afforded to the attacker for rapid concentration for a raid.

(iii) *The development of small craft.* The coastal motor boat, with its small size, high speed, and wonderful steering qualities, has introduced a new power to the close attack by torpedo of vessels lying in roadsteads or harbors. Owing to its small size, it will be exceedingly difficult to detect during the hours of darkness, and its high speed and quick steering will render it a peculiarly difficult target to engage with gun-fire. It is, however, very vulnerable, and a single hit from even the lightest gun will probably be sufficient to cripple it.

(iv) *The light-draught heavy gun carrier.* This type of vessel, known as a *Monitor,* was primarily designed for operating in the shallow waters off the Belgian coast. It is practically unarmored and carries one gun (or two) of the largest size. Its rôle is bombardment of land targets where the small depth of water will not allow of the operations of larger craft. For this reason it is particularly invulnerable to submarines. It is not designed to fight against other warships, and consequently it can only operate during the absence of hostile vessels or when protected by units of its own fleet, but, for the same reason, it can use a type of projectile more suitable for engaging land targets than can the capital ship.

(v) *Artificial fog.* This development, given the required atmospheric conditions, is a very powerful adjunct to certain forms of attack, such as blocking, boom-smashing, or attack by light craft. It can also be employed where long-range bombardment is being carried out by indirect fire. It is, however, a weapon which may recoil on the head of its user, should a change of wind occur unexpectedly, and it also suffers from the disadvantage that it can only be used under suitable atmospheric conditions, so that it may not be available at the very time when it is most desired.

Developments in the defence

As regards the defence, developments have been few, owing to the rarity of attacks. They have been chiefly in the direction of improvements to existing means and methods, rather than in the introduction of innovations, and have mainly affected the ancillaries of coast defence such as means of observation, range-finding, etc.

Developments of the air arm

It is unnecessary to labor the point of the vast changes introduced, both for the attack and the defence, by the development of air-craft.

Where, formerly, we had to consider operations by sea and land only, we now have to make preparations for warfare in a third element. Our ideas, therefore, both of attack and defence must necessarily be largely revolutionized, and our methods will require adjustment, in order to meet the new conditions.

Air-machines, whether in attack or defence, have three main functions to perform, viz: offensive action, reconnaissance, and observation of fire.

Let us examine these activities from the points of view of the attack and the defence separately.

(a) *Aircraft of the attack.* The first, and perhaps the most important, point to notice, is that one of the chief factors in successful attack is enormously strengthened by the advent of aircraft, i.e., the factor of *surprise.* Not only does the immense speed of aerial machines very greatly reduce the time occupied between the inception and delivery of an attack, but their small size and consequent ease of concealment renders the preparation of, and concentration for, attack immeasurably less easy of discovery by the scouts of the defence than in the case of assemblies of naval or military forces. Where, in the old days, we might expect some *days* notice of an impending attack, we shall now probably have only as many *hours.* This consideration, therefore, shows that one of the first requirements of the defence is—Instant readiness for action.

The objectives of an aerial offensive action will be, so far as coast fortresses are concerned, the same as those hitherto accepted as the objectives of naval attack, i.e., firstly, important works, buildings, docks, etc., lying within the defended perimeter, secondly, warships lying in harbors or roadsteads, and thirdly, the actual works of defence themselves. An aerial attack will be made both by bomb-dropping and fire from machine-guns. Owing to the speed at which it will be carried out, there can be no question for the defence of "holding off" the attacker pending the arrival of our aerial fleets, as in the case of bombardment by sea. If our fighting air squadrons are not actually on the spot, the attack will necessarily be finished before they can arrive.

The second function of the attackers aircraft will be reconnaissance, for the purpose of discovering the disposition and activities of the defence. This function may be combined with offensive action as described above.

The third function, observation of fire, will necessarily be an adjunct of a naval bombardment, and, by its means, such bombardment will be possible at the most extreme ranges.

It must be observed that both these two functions will necessitate the presence of the attackers machines over, or in the close vicinity of, the fortress for some considerable time, during which they will be liable to be themselves attacked by gun-fire and by the defender's aircraft. They will therefore certainly be accompanied by fighting machines, for their protection while carrying out their duties.

(b) *Aircraft of the defence.* The main functions of the defender's machines may be stated in order of importance as follows:

Reconnaissance—in order to give timely warning to the garrison of an impending attack by air, sea, or land.

Fighting—to destroy or drive off the attackers machines when approaching the fortress for either of the purposes mentioned above, and also for the protection of the machines engaged in—

Observation of fire— to assist the artillery of the defence in dealing with an attack by naval forces.

Offensive action—the direct attack, by bombing, of hostile vessels.

CHAPTER V

Attack and Defence

As we have seen above, we must be prepared to deal with land attack, naval attack, and aerial attack, therefore our defences must consist of land defence, seaward defence, and aerial defence.

Land defence

It has always been accepted as an axiom that, as a general rule, the land defence of a coast fortress is the business of field forces whether located within the perimeter or operating against the attacker from without. In certain localities, however, no such protection may be available, and, in any case, it will be necessary to provide some means of defence from within, to guard against capture by a *coup-de-main*, before the field army can arrive on the scene. For this purpose every coast fortress must include in its garrison mobile troops of some description. The duties of this mobile force may be stated as:

(a) The close defence of vulnerable points.
(b) To hinder a landing by the enemy, within, or near to, the fortress.
(c) To attack the enemy when disembarked.
(d) To hold the landward front in the case of isolated fortresses, or in the absence of a field army.
(e) To maintain order among the population within the fortress.

The main object of the land defences is to keep the enemy as far away as possible from the fortress. For this purpose, therefore, risks will have to be accepted, and great mobility and a high standard of training will be necessary. In certain isolated places, the guns of the seaward defences are so sited as to be able to engage an enemy attacking from the land, but this is a subsidiary, and not their primary, rôle.

Seaward defence

The defence of a fortress against attack from the sea has, in the past, consisted of:

(a) Extended defence, provided by the navy, and consisting of cruisers, destroyers, submarines, etc., whose object is to seek out and

attack hostile vessels before their arrival within range of the guns of the fortress, and

(b) Local defence, consisting of guns and searchlights provided by the army, and booms, nets, and minefields provided by the navy.

It is important to notice that the admiralty, though approving the principle of extended defence, and though willing to supply the means whenever possible, has always declined to allot mobile forces permanently for the defence of particular localities. This attitude is undoubtedly reasonable, since the main object of our navy is to clear the sea of the enemy's fleets, and not merely to stave off his attacks whenever and wherever made.

As regards local defence the chief point to consider is the coast defence gun. We have seen that the increased power of naval guns, combined with the development of the air arm, maed it possible for bombardment to be carried out at ranges hitherto undreamed of. At the same time we know that the chief deterent to bombardment by capital ships is the fear that they, the important units of the enemy's main fleet, may be destroyed in carrying out what is only a subsidiary operation. And therefore we might assume that long-range bombardment on a large scale need not be anticipated. But here we must remember that the capital ship of to-day is the obsolete ship of tomorrow, though armed with the same gun and protected by the same armor. Hence we must be prepared for bombardment in the future from ships which have all the power of the present-day capital ship, but which, being then obsolescent, the enemy will be prepared to sacrifice. It will therefore, perhaps, be not unfair to lay down certain assumptions, e.g.

(i) That the enemy will not risk his (then) capital ships if possible.

(ii) That he *will* risk his obsolescent ships and monitors, in direct proportion to the importance of the place he is attacking.

(iii) That 40,000 yards is a reasonable range at which we must be prepared to engage him.

(iv) That the guns which we employ must be capable of penetrating present-day deck armor at that range.

For these two latter purposes it is evident that our present heaviest coast defence gun is unsuitable. It must therefore be replaced by a more powerful gun, and it would appear that nothing less than the 12″ would answer the purpose, if, indeed, it is sufficient. Probably a 15″ gun will be required.

Similarly, since attack by cruisers or block-ships, will be carried out by vessels of present-day protection, our medium armament will require to be strengthened, and for this we suggest the 9.2″ or 7.5″ gun, according to the importance of the port.

Our light gun, for defence against torpedo craft, is an important consideration. It will not be sufficient to *damage* a hostile vessel,—it is essential to *stop* her before she arrives at a position where she can do damage. For this purpose, our light armament should consist of 4.7″ to 6″ guns, with perhaps a light automatic gun, or heavy pom-pom, for dealing with craft such as coastal motor-boats.

This re-armament appears, at first sight, to be a formidable matter —but it is not, probably, so large as it seems. We are not proposing to provide against operations by large numbers of vessels, but against individual ships or small groups. Consequently, though we suggest increasing the *power* of our guns, we could probably reduce their *numbers*. Due consideration of the probability of attack at each port, followed by careful siting of the allotted armament, would probably enable us to provide the necessary deterrent against bombardment, and the necessary obstacle to success of other forms of attack.

Guns on railway mountings

Many suggestions have been made, from time to time, that the most economical method of defending our coast would be the installation of heavy guns on railway mountings, running on railways which should be laid along the coast line. The argument in favor of this is that it would deny to the enemy many sea areas from which, at present, he can carry out long range bombardment unmolested by gun fire. There are, however, several arguments which can be advanced against this proposal, among the foremost of which is the loss of accuracy in gun fire. which it would entail. We do not want only to frighten the enemy, but to damage him. And financial considerations demand that we should do this damage with the smallest possible amount of ammunition. In other words, every round should be a hit. Provided that we have a gun, powerful enough to reach an enemy vessel at any range within which it must approach in order to bombard, and sited in such a way that, with aeroplane observation, it can engage a target in any direction within that range, it appears that it would be unwise to sacrifice the advantages conferred on the gun by the possession of a fixed and stable mounting. It would seem that the protagonists of railway guns overlook the fact that coast fortresses are not designed to protect the whole of our sea-shore, but are intended merely to protect important objectives lying within their perimeter.

Aerial defence

As on the sea, so in the air, will it be necessary to provide for extended, as well as local, defence. The former will, of course, be solely the function of the R. A. F. The latter will be the combined duty of the army, with guns and searchlights, and of the R. A. F., with fighting aeroplanes. And here we arrive at a most important consideration. In local defence seaward, the part of the navy is restricted to what may be termed the passive defensive, i.e., defence by means of mines, booms, nets, and other obstructions to navigation. In local defence air-ward, however, it must be accepted that no such passive defence can be completely efficacious, and hence the part of the R. A. F., must be an active defensive. All recent developments seem to show that the R. A. F., is becoming more and more truly independent, and there may well be reason to fear that the air ministry may adopt as regards both extended and local defence, an attitude similar to that of the navy in regard to extended seaward defence. Such an attitude would, of course, be deplorable. For local defence against aerial attack, the defence commander must have, as the chief of his weapons, a definitely fixed number of aeroplanes, and these machines must not be susceptible to removal without his consent. They must be looked upon as a permanent portion of the armament of the fortress, of equal importance with the anti-aircraft gun, since it must be admitted that guns alone cannot at present compete completely with aircraft.

The main objects of the air defences will be to guard against:

(a) Bombing attacks on ships or other important objectives within the fortress.

(b) Bombing attacks on the works of defence.

(c) Reconnoitring or observing aircraft.

(d) Torpedo dropping aircraft.

In order to carry out these attacks with accuracy the enemy aircraft will have to fly at a low altitude. It will be the object of the aircraft of the defence to endeavor to prevent this low flying, by attacking the enemy during his approach to the fortress, but, should he evade the defenders, it will be for the guns of the defence to deter him from close approach or destroy him when carrying it out. An efficient or-

ganization of anti-aircraft guns will therefore be required. These guns should be of the nature of 4″ caliber, and should have an effective height of at least 20,000 feet.

There is very little doubt that many of the attacks will be made at night and consequently provision must be made for anti-aircraft searchlights, both of the "sentry beam" nature and fighting lights. These searchlights must be entirely distinct from those of the seaward defence, though of course each will assist the other if not required for its own purpose during an attack.

CHAPTER VI

Conclusion

We have seen that the coast fortress of the future will be liable to attack by land, sea, and air, and that to meet these attacks we shall require military, naval, and aerial, defences. In the case of each form of attack, a combination of at least two of the means of defence will be required. Thus our first and greatest lesson is the need for the closest possible co-operation between the three fighting services.

We have seen that developments of the past few years have greatly enlarged the scale of attack which may be expected. Hence we see that the scale of defence must similarly be greatly extended.

In the remarks above, for reasons of space, little has been said about the progress of what may be termed the ancillaries of attack and defence, such as the various methods of detection and ranging, surface, sound, and sub-aqueous, the development of lethal and non-lethal gas, the methods of producing artificial fog, the use of anti-bomb nets, bomb-proof protection, camouflage, etc. These matters are all more or less in their infancy, but they are advancing with rapid strides, and we must not allow ourselves to fall behind other nations in these respects. Thus our third lesson is the need for continuous and pains-taking experiment and research.

Having learned these lessons, we must then apply them. It has been pointed out that all coast fortresses cannot be treated, for purposes of defence, on the same lines. The first thing to do is to determine the probable scale of attack. This, as we have seen, will depend upon the desirability of the objectives, the distance from enemy bases, and political and natural considerations. Having decided on the probable scale of attack, we can then calculate the necessary scale of defence. And when this has been done, the final step is, obviously, to carry it out. This is the ideal. Is it however, practical? We think not. We have seen that to provide a full scale of defence under modern conditions will, in most cases, entail a considerable rearmament of existing fortresses, and we have to bear in mind that the present financial stringency precludes any expenditure which is not absolutely vital to our safety. Also we must recollect the two 10 year factors mentioned in chapter I, and their bearing on our problems. When looked upon from this aspect, it appears that it would be folly to expend a large amount of money at this juncture, on heavy re-armament of, or on full complements of personnel for, our coast fortresses. There are, however, certain fields of activity which must on no account be starved. We refer to experiment, research, training, and practice. The development of methods of attack and means of attack, though perhaps retarded, will not stand still, and it is incumbent on us to ensure that means and methods of defence are developed in at least an equal degree.

From war experience we arrive at certain deductions, which, however, require modification in accordance with post-war conditions. What, then, may we anticipate as being the condition of our coast fortresses during the next ten years? Guns in a state of "care and maintenance,"

P.Fs. and other instruments dismantled or covered up, mine-fields unlaid, anti-aircraft defences non-existent, and, last but by no means least, personnel cut down to the minimum required as caretakers. This will certainly be the case during the next year or two, while financial conditions are so stringent. But it must not be allowed to continue indefinitely. So long as human nature remains what it is, so long will fighting be the ultimate method of settling differences. Peace Conferences may assemble, Leagues of Nations may record resolutions, and the international policeman may intervene between disputants, but, though these bodies may *dissuade* from or *forbid,* they cannot *prevent,* war.

The statement which forms the motto for this paper was never more true than it is to-day, although war-weariness has, perhaps, blinded us to the fact. We have, no doubt, to face a period of stagnation as regards our coast defences until more money is available for their development. But we must, as soon as our finances allow, begin a progressive and comprehensive re-armament and re-organization on the lines and the subsequent period of development, we must do our utmost, by experiment and research, to keep abreast of every scientific and mechanical advance, and we must establish that close co-operation between the army, the royal navy, and the royal air force, which alone can ensure the proper fulfilment of the rôle for which our coast fortresses are designed.

Training, owing to shortage of personnel, is almost impossible of achievement for the time being. We can at least, however, train as *instructors* the scanty personnel we possess, so that in the brighter days to come they may be able to teach the "new entry." And it seems desirable here to emphasize that it will not be sufficient to rely entirely on the territorial army for the artillery portion of our coast fortresses. Not only does the R. G. A., form an important reserve of very highly trained men for the field army, but, in the critical early days of a war, it will be essential to have our defences manned by personnel who will not require any "shaking-down" process as a prelude to efficiency.

Thus, then, the future which we deduce for our coast defences during the next ten years is:

(a) A period of perhaps two or three years during which the whole of the money available for the fighting services will be devoted, and rightly so, to the organization and perfection of our means of offence, and the passive defence, as represented by coast fortresses, will remain "in status quo." During this time no re-armament or other material development will be possible, and training will be practically nil.

(b) The period subsequent to (a), when the return of financial prosperity may enable us, not only to complete our preparations for the offensive, but also to devote funds to the development of the defensive. During this period, our defensive energies will be turned, in increasing intensity, to the development of our material and the training of our personnel, up to the standard which our war and post-war experience shows to be necessary.

(c) And, throughout the whole of both these periods, we shall be carrying on systematic and pains-taking experiment and research, so that we may ensure for ourselves a position at least abreast of our possible rivals, should the peace of the world again be disturbed.

There is no doubt that the mere existence of the first, i.e., the stagnant, period will exercise a damping effect on the ardor of many an otherwise enthusiastic garrison gunner. But let us remember that, the lower we fall, the greater will be the honor when we have again raised coast defence to the eminence attained by it in the past. And the rapidity

with which we can do this will depend on the extent to which we fit ourselves, during the stagnant period, to instruct those who follow us.

Experiment, research, co-operation training. Let these be the watchwords of our coast defence organization, and we may then look forward with confidence to a time when, with our defences re-armed in accordance with the demands of the two former, and our personnel prepared by the two latter, we may face any or all of our potential enemies, saying, in the words of the song—"We don't *want* to fight, but, by Jingo, if we do—." *The Journal of the Royal Artillery.* No. 4 Vol. XLIX

THE TENDENCY OF WARSHIP DESIGN AS AFFECTED BY THE WAR.—By Sir Eustace T. D'Eyncourt, K.C.B., D.Sc., F.R.S., Vice-president Director of Naval Construction.[1] This summer meeting, taking place, as it is in Paris, appears to demand more than is usually the case at the meetings of this institution some general *résumé* of the present conditions governing the designs of ships generally, and although I do not propose to go into the very large question of mercantile ship design, I venture to think that a few remarks on the present aspect of warship design may not be without interest to the members who are present, and may possibly call forth an interesting discussion from some of our continental members, who have not had very frequent opportunities of attending the meetings in London.

Now that the war has been over for three and a half years, we can glance at the whole situation with a calmer view than could be taken of it at a date less distant from the close of hostilities, when our minds were still working at fever heat to produce continuously improved weapons, both of offence and defence.

It is hardly necessary to point out that in the years immediately preceding the war enormous developments had been made in naval architecture, in marine engineering and in gunnery, and other branches of engineering science directly bearing upon the design and production of war material; but, although this development was very evident in the years immediately preceding the war, as soon as the war started it proceeded at an incredibly increased rate, being largely helped by the fact that during the war the question of cost hardly had to be considered at all, provided that the war material could be so improved and supplied as to aid in the achievement of victory. This factor alone contributed to the extraordinary advance made in every kind of scientific weapon, to a degree which had, I think, never before been approached; for, though in earlier wars the same kind of thing no doubt took place, on all previous occasions science had not progressed to anything approaching the condition in which it was found in 1914, and therefore on no previous occasion had it been possible to make such extraordinary improvements in scientific implements of all kinds. These improvements profoundly affected the designs and characteristics of our ships. Entirely new types were developed and the old types were improved, and as the war proceeded and battles were fought, new lessons were learned and the results were as far as possible embodied in new construction. An interesting point, I think, is that although, as I say, new types had to be developed, yet it was found that all the existing types, perhaps with certain modifications, were of great utility, whether capital ships—battleships and battle-cruisers—light cruisers, destroyers or submarines. Owing, however, to the long time which it takes to construct the heavier classes of ships, the developments made in the smaller types were more marked than in the larger, because the new material was always wanted at the earliest possible moment.

Now that the war is over and we have been able to think more calmly about the whole question of design, certain points stand out which call for more particular study and comment than was the case in pre-war days.

[1] Institution of Naval Architects, Paris Summer Meetings.

One of the principal points to be specially considered is the great development of under-water attack, whether by submarines, mines or torpedoes, all of which greatly added to the danger to which ships were continually exposed. Submarines became much more efficient, mines were laid in numbers over an extent never before dreamed of, and torpedoes were increased in size and efficiency, and were carried in larger numbers by all classes of ships than had ever been previously experienced. It therefore became almost a necessity to pay special attention to the under-water protection of, at any rate, all the more important classes of ships, and it may therefore now be taken, I think, as an axiom that capital ships must have a very large proportion of weight devoted to their under-water defences. In this connection, I think it should be remembered that the older classes of ships which had been designed some time before the under-water attack had become so imminent a danger, in almost all cases came off badly when struck by torpedoes or mines. This was due in part to the inferior protection given to the sides of the ships below water, and also very largely to the fact that in many cases longitudinal center-line bulkheads were fitted which prevented the ships retaining an upright position when damaged on one side; the large amount of water admitted was thus confined to the damaged side only, and in this way many of the older battleships and cruisers capsized. One of the first objects, therefore, was to improve this state of things, and none of our later ships fitted with the newer forms of under-water protection was ever lost by the action of an enemy torpedo.

The second great point of difference which has to be considered in post-war designs is the very much greater range at which actions were fought during the war had been anticipated, and this in spite of the rather unfavorable atmospheric conditions which generally obtained in the North Sea. In future ships, therefore, the ever-increasing range of guns themselves and of the distances at which actions are likely to be fought must be kept in view to an extent not contemplated in earlier designs. Before the war it was thought that actions would be fought at perhaps something under 10,000 yards range. Now provision has to be made for ranges fully twice as great. To the ordinary observer it might not appear that this difference would very profoundly affect the designs of our ships, but a very little consideration shows what an important matter it is. At ranges under 10,000 yards the projectiles, as a rule, when striking the object, are coming down at an angle of certainly not more than fifteen degrees to the horizontal, whereas at the greater ranges the angle of descent of the projectiles may be thirty degrees, or even more. At the steeper angles of descent the decks of the ships present a larger target than the sides, and with the old thicknesses which were given to protective decks in former designs, the larger shells would have no difficulty in penetrating to the vitals, so that one good shot from a big gun might enter a magazine and explode it, thus destroying the ship in a moment. It therefore becomes a paramount necessity to increase as far as possible the thickness of protective decks over the vital parts of the ship, whilst we still have to maintain the armor belt in the neighborhood of the water line in order to preserve intact the water-plane and the stability.

A further point necessitating special attention being paid to the protection especially of decks is the new menace of attack from the air. This has added an entirely new factor to modern naval warfare, though even at the end of the war this method of attack had not really been developed nearly as highly as it is likely to be in the future.

The naval designer, therefore, at the present moment is faced with the necessity for providing against new forms of attack both above and below water, all of which demand greatly increased weight in the working out

of the design. At the same time he is offered no compensating advantage, or very little, in the reduction of side armor or any other item; for as the size and weight of the guns have continually increased, so had also the demand for increased speed, and therefore the weight of propelling machinery, boilers, fuel, etc.

Some advance has no doubt been made in the improved quality of steel, but any slight saving in weight of structure which can be made by the introduction of better material is not at present enough to compensate for the increase of weight due to additional items such as wireless and control apparatus and many other additional fittings.

These considerations, therefore, taken together, have tended to produce very large and very costly capital ships, and they would no doubt have increased to an enormous extent had not some limit been put to the size of ships and guns by the Washington Conference. In view, therefore, of the general necessity all over the world for economy of financial resources, if for no other reason, the enactments of the Washington Conference should be welcomed at any rate by the taxpayer, if not by the men of the fighting forces themselves, and I may perhaps add, by the naval architects and suppliers of munitions of war.

Consideration of these points naturally leads to the questions: Are these enormous ships worth building? Can they be regarded as necessities? Can they be relied upon as the best means of defence and attack, or will they become an easy prey to some of the new methods of attack which have been enumerated?

Although the increased efficiency of attack under water, and also from the air, demands our earnest attention, nevertheless experience shows that the exaggerated claims of the enthusiasts who favor submarines on the one hand, or those who advocate aircraft on the other, should not be allowed to carry too much weight. For novel weapons it is always claimed by their advocates that at last an arm has been discovered which supercedes all others, and may, in fact, put an end to war, so irresistible is its power compared to that of all previous war material. Such claims have in the past been advanced for the rifle, the big gun, the machine-gun, the torpedo, the torpedo boat, the submarine, and many other engines of war, but every time experience shows that the potency of new inventions can be met by some antidote, which largely discounts the value of the idea, and experience compels the claiments of irresistible force to modify their earlier optimistic prophecies of the wonderful results of their discoveries.

It is hardly necessary to go into all the arguments of the necessity for having capital ships; but after weighing all the facts, it is generally admitted by competent authorities that as long as ships of any kind sail on the surface of the seas, the most powerful surface craft will always be the principal unit of any fleet.

As far as defence goes, at the moment our experiments and actual trials on the full scale show that we can make our ships reasonably secure against under-water attack from mines or torpedoes or from bombs dropped in the water alongside. Further, I consider that the decks can be so thickened as to be able to withstand modern gunfire at long range, or any bomb of weights which can at present be carried, provided always that too great demands are not made upon the naval architect to carry an abnormal weight of artillery or that the ships should at the same time be capable of very high speeds.

One thing is quite certain, viz., that with the enormous cost of capital ships, no wise man, whether he be a naval officer or statesman, would advocate the construction of the most expensive type of ship in these days of necessity for economy, unless he were convinced of the need for having them, and no experience of the war or experiments since the war show

that it is possible to do away with capital ships, and to devote all the money available to the construction of cruisers, submarines, destroyers and other types. All these types are no doubt necessary adjuncts, but the most powerful capital ship it is possible to construct still remains the prime necessity of any first-class navy.

As regards other classes of vessels, the war showed the necessity, as I have said, of nearly all the classes previously developed, which was, I venture to think, in itself a testimony to the foresight and intelligence of the naval officers and naval architects of the various great navies of the world. Demands were made in every class of ship for more speed, more armament, and more protection, so that every type tended to get larger and larger. This is seen in the continually steady increase in size of light cruisers, of destroyers, and of submarines. Perhaps the development of the latter of these classes was the most remarkable of all, and showed a greater percentage of increase of size and of speed in the same period than had been achieved in any other type of vessel. It is only a few years since the largest submarine was of a few hundred tons displacement. At the end of the war there were submarines of 3,000 tons weight and having speeds up to 24 knots; and the British navy had developed some experimental boats carrying a 12in. gun.

An entirely new type of ship, which was developed during the war, was the aircraft carrier. At first small merchant ships were taken up and adapted for this purpose, but as the necessity for carrying aeroplanes at sea became more and more insistent, larger vessels were taken up, and the special arrangements for flying on and off were developed to a very high degree. Although most of the aircraft carriers are still converted ships built originally for other purposes, the alterations are so extensive that the ships as converted practically amount in many cases to an entirely new design. These vessels, which really correspond to the large hangars on land at the back of the fighting armies, are required to keep up with our fleets and therefore to have high speed, to have good sea-going qualities, and to be steady platforms for flying off and flying on, with all special fittings and arrangements necessary to carry out these operations successfully; and there is very little doubt that large aircraft carriers will in the future form an integral and absolutely necessary portion of any first-class fleet; and, further, these vessels will no doubt be specially designed for the purpose and developed to even a greater extent than has hitherto been the case.

It would seem to be difficult to arrive at any finality in the design of aircraft carriers, owing to the immense progressive development of aeroplanes, especially those of the larger classes designed to carry heavy bombs and other weapons of attack. To arrange for the safe flying off, landing, and stowage of these big machines has given the naval architect new problems in ship design, which appear to call for quite as much inventive genius as many of the older problems with which naval architects have hitherto been faced.

Reviewing the whole situation generally of the tendency of warship designs as affected by the war, it appears that the naval architect has to deal with an even more complicated set of requirements which must be met in the up-to-date warship than ever was the case before; for, in spite of the fact that the war lasted over four years, no finality was reached in the development of any of the weapons of war which were in use up to the armistice, so that, although the ship designer is aware of the many varied and difficult problems which presented themselves to him during the war, most of which he successfully overcame, he has still to consider the further problems of more or less unknown character which the enormous development of science has brought about in the ever-increasing

power of weapons of offence and defence which have to be provided for in the design of warships.—*The Engineer*, 7 July, 1922.

SOME OF THE CONSEQUENCES OF THE WASHINGTON CONFERENCE WITH REGARD TO NAVAL CONSTRUCTION.*—After outlining the restrictions imposed by the Washington Conference the author observes that the 35,000 tons maximum displacement allowed by the Conference is not sufficient if the problem of the present-day battleship is to be solved "without compromises." Is it possible to make better provision in view of possible progress of technical knowledge, or on the basis of acceptable modification in the actual requirements of modern battleships? In order to arrive at a conclusion he then briefly examines the various requirements of the modern battleship, indicating some possible modifications. He concludes that it will not be possible to adopt guns of less than 16in. caliber, and he regards it as not impossible, especially in southern seas, that new means of fire control and spotting may enable the range to be still further increased, considerably beyond the horizon.

Discussing the minimum number of guns, he observes that there would seem to be a possible way of reducing the displacement of battleships in the near future, by building "super-rapid" gun mountings, which would require only ten seconds between each shot, and possibly even less. Naturally, a gun with "super-quick" firing would weigh considerably more than one of normal design, and therefore there follows the necessity of insisting on an increase in the number of guns of each turret, following the advice of the Italian engineer constructors Ferrati and Madsea.

Turning to secondary armament, the author remarks that it is necessary to have a single type of mounting, naval and anti-aircraft, in the guns of medium caliber up to 6in.; thus uniting the anti-aircraft and anti-submarine guns. Designs on these lines are already well advanced, so that the problem may be considered as already nearly solved. But the actual number of guns in these batteries should be increased from the present twelve to sixteen, and, on the whole, rather than consider a reduction in the weight of secondary armament, we must frankly face a considerable increase. As to the use of larger ships as platforms for aircraft, the author says it would seem that this will have to be limited, at least for the present, to the smaller aeroplanes for reconnaissance and observing of shots, launched by means of catapults similar to those in use in the American navy.

In conclusion, as regards offensive power, we may say that the only direction in which we can hope to effect the reduced displacement of future battleships is by a radical modification of the heavy artillery, which would allow of a diminution, to a certain extent, in their number. Reduction in the lesser armament and in under-water protection does not seem either possible or advisable.

On the subject of defence the author discusses side protection, deck protection, and under-water protection. For the side protection we must still have recourse to massive external defences. As a defence against 16in. shells, plates of equal thickness would probably be necessary, even at long ranges. But even by reducing the vertical protection to the indispensable minimum no great advantage as regards weight can be obtained. The utmost importance is given, and rightly, to the deck protection, as the horizontal target is by far the greater, not only in aerial attacks, but also against artillery at the actual ranges of battle.

Under-water defence is now of fundamental importance and is allied to the strength and stability of the ship. The three known fundamental so-

* *Résumé* of paper read by Major L. Fea, of the Royal Italian Navy before the Institution of Naval Architects, Paris Summer Meetings.

lutions of the problem are: The bulge system, proposed and experimented upon by General Ferrati in 1911, and largely used in the British navy: the system of water-tight compartments, investigated in 1892 by the late General Benedetto Brin, which is largely used in the American navy; and the system of "hydrodynamic action" of Colonel Pugliese. Other systems have been tried with success, but these three, which are based wholly or in part on metallic structures or large masses of liquid, are those which have the greatest probability of being retained in the future, as the weight of liquid fuel is not inclined in the "standard displacement" of Washington. Here we see that the Convention of Washington may have some curious results upon naval construction, almost as the tonnage rules have had upon mercantile naval construction.

A further system of defence will in future have to be provided, that is, against poisionous gas, whatever may be the consequence of the Washington Conference as to the abolition of this gas in future wars.

As regards the intrinsic qualities of the ship, advantages can only be obtained by means of steady and continual perfectioning of the design and material. These improvements might, amongst others, relate to:

(1) The use of more perfect materials.
(2) The general use, if possible, of welding instead of riveting.
(3) The incorporation of the protective elements with the structural ones.

Concluding, the author says that the analysis which we have made regarding the various qualities, naval and technical, of the modern battleship does not leave us any illusions as regards the impossibility of being able to comprise within the limits of displacement fixed by Washington all the offensive and defensive power which at the present day would seem desirable. It would be well to note that, whatever may be the road which it will be necessary to follow in order to gain this object, two conditions must be observed: a systematic and profound study of all the material which is necessary for the construction of such a complex machine as the modern warship; and very great expense, which may cause one to doubt whether the ship of the future of 35,000 tons imposed by the Washington Conference will really cost the various governments much less than the present-day ship of 40,000 tons.—*The Engineer*, 7 July, 1922.

NAVAL DESIGN AND THE WASHINGTON CONFERENCE.—Sir Philip Watts has made a written contribution to the discussion on the above subject at the Paris meeting of the Institution of Naval Architects, which was reported in our issue of the seventh instance. This discussion followed the reading of papers by Sir Eustace D'Eyncourt on "The Tendency of Warship Design as Affected by the Washington Conference," and by Major L. Fea of the Royal Italian Navy, on "Some of the Consequences of the Washington Conference with regard to Naval Construction." Sir Philip's contribution is as follows:

Sir Eustace d'Eyncourt's paper is a most interesting contribution to the series of papers on warship design which our transactions for the past four years contain. The series includes my paper in 1919, which gives a fairly full statement of the design particulars of the ships of the British royal navy at the outbreak of the war, and in the same year Sir Eustace d'Eyncourt's paper which dealt with warship construction during the war; then followed in 1920, a paper from Sir Eustace on H.M.S. *Hood*, and, in 1921, notes from him on German warship construction. Also, in the same year, there was a paper by Mr. S. V. Goodall, constructor in the royal corps of naval constructors, on the ex-German battleship *Baden;* and, in our spring meetings of the present year, we had a paper by Mr. J. H. Narbeth, assistant to the director of naval construction, giving certain

particulars relating to the designs of *King Edward VII, Lord Nelson,* and *Dreadnaught.* All of these papers were freely discussed by many naval officers and naval architects concerned with warship construction.

Sir Eustace's present paper deals with the aspect of the problem, subject to the restrictions of the Washington Conference, which in simple terms, involves the limitation of the number, displacement, and gun caliber of our capital ships. As contingent on these, we have to consider the following: (1) The best available protection from attack by enemy aircraft. (2) The best available deck protection from projectiles dropping from enemy guns. (3) The best available above-water broadside protection from enemy guns. (4) The best available protection from underwater torpedo attack, whether fired by submarines, torpedo craft, larger vessels, or otherwise. (5) The best available protection from mine attack. (6) The highest available gun power. (7) The highest available speed.

There are of course, other elements involved, *e.g.*, radius of action, but the above may, I think, be taken as the principal features.

Sir Eustace does not give many detailed particulars of the methods by which it is proposed to secure the best balance, between all the conflicting elements of the problem. These, of course, we cannot expect. Our own and other admiralties, at the present moment, are engaged in maturing their designs, and no one of them is likely to make an early pronouncement on the subject. To use a well-known phrase, we must "wait and see."

Sir Eustace's remark "that all the existing types, perhaps with certain modifications were of great utility," is perhaps rather fainter praise than he intended. Those types had to meet the enemy in all the principal naval actions, and it was with them the war was won. All the principal ships engaged at the Falkland Islands, Dogger Bank and Jutland were of pre-war design.

Sir Eustace points out that the older classes of battleships and cruisers (pre-*Dreadnaught* ships) in almost all cases came off badly when struck by torpedoes. Most of these vessels which were sunk by a single torpedo were protected by a longitudinal vertical bulkhead along their side; when struck, the side was smashed, the adjacent compartments flooded and the ship capsized from lack of stability. In some cases the upsetting couple would have been less if there had been no middle line bulkhead. In all cases the vessels sank through insufficient stability, and if they had had sufficient stability, possibly none of them would have been lost. The newer forms of under-water protection referred to by Sir Eustace mainly depend on increasing the beam or breadth of the ship and thereby increasing her range of stability. The extent to which protection can be given against torpedo attack by placing armor and other resisting material in the side spaces is limited; a torpedo may get under the turn of the bilge and explode beyond this protection, and when the ship rolls to a comparatively small angle the whole of her bottom is exposed to attack, the target may be doubled or more than doubled and most of it will be quite unprotected. The greatest safety lies, after reducing the size of the compartments to a minimum by suitable subdivision, in providing the most stability that is consistent with other essential requirements to keep the ship upright as long as possible, if compartments be flooded in succession. It may be true that we can "at the moment" make our ships "reasonably secure" against torpedo attack, to the extent, say, of two or even three explosions, when they are upright and not rolling, but underwater attack must be expected to grow in strength, torpedoes can easily be made of any desired power and can be produced in a comparatively short time.

With regard to the greater range at which actions were fought, I am not sure that I am quite in agreement with Sir Eustace. In one of the early conferences held by Lord Fisher on the *Dreadnaught* design, the

probable course of events in an action supposing two hostile fleets or squadrons equally intent on fighting were to meet, was discussed, and it was agreed that firing would commence as soon as they got within such a range that there was a reasonable chance of hitting, say, 14,000 yards with the 12in. guns of that day, which with 13½ degrees maximum elevation, have a range of 15,000 to 16,000 yards. This was in the minds of the officers who had to deal with the distribution of deck and side protection. (Fighting at these ranges actually occurred in the war at the first encounter in 1914 when Admiral Sturdee's squadron met Von Spee's also at almost every encounter afterwards.) What we did not complete in the *Dreadnaughts* was that descending shell would get through our upper and main decks and fittings and travel considerable distances without exploding; it was anticipated that the shock would cause the fuse to act and the shell to burst before reaching the protective deck. This was pretty much the view held when war was declared. We soon found, however, that the German T.N.T. shell with delay action fuses could penetrate our decks and travel considerable distances before exploding. This is why we had to increase the thickness of our armor decks over the vital parts of the ship.

I concur most heartily with Sir Eustace's statement that: "The most powerful capital ship it is possible to construct still remains the prime necessity of any first-class navy." Much has been said to the contrary, but I strongly support Sir Eustace in his view. Lord Selborne, who was at one time, and a very critical time, first lord of the admiralty, and has given great attention to the matter, said in his place in the House of Lords, on June 20 last: "The admiralty has done great service by standing fast on the question of capital ships. So far from the days of the capital ship being numbered, the lessons of the war prove the contrary."

Sir Eustace's paper is, in part, historical, but it is, as, no doubt, it was intended to be, mainly a suggestive one; it states some broad views on important matters and concentrates attention on the difficulties of the general problem, and I submit we are very much indebted to him for it.

Major Fea's paper is one of very great merit. It gives us another example of which many have been furnished, showing how very thoroughly Italian officers study matters relating to the design of warships. In fact, the matters involved here have been so fully and so clearly dealt with that I find very little to say inside of the general scope of what is presented to us beyond what Major Fea has himself said. I am, generally speaking, in entire accord with all Major Fea states.

There can be no doubt that the decisions of the Washington Conference create an entirely new position as regards the problem of warship design and that much time and skill will be required successfully to meet the new conditions arising therefrom.

I am particularly interested in Major Fea's statement as to the possibility of reducing the number of the principal guns in a battleship when associated with great rapidity of loading, properly related to the time of the rolling of the ship, without real sacrifice in the offensive power of the main armament. I am not so sure that I agree with the proposal of Monsieur Doyére, referred to in the paper, "to employ quadruple turrets." If the guns are to be 16-in. guns, the resulting turret must not only be very large, involving special difficulties, but the concentration of such a large portion of the main armament in one turret involves a very serious risk of many guns being thrown out of action by a single blow.

I concur in the remarks made by Major Fea in his paper as to above-water armor-deck protection, particularly where he says "In other words, it would be advisable to sacrifice the part of the ship above the principal protective deck as long as we can, at any cost, save the one underneath." Major Fea has done well, I think, in calling attention again to the desirability of incorporating, as far as possible, the protective elements of a

vessel with the structural features. This method of construction was adopted by me in the designs of the modern light cruisers of the British navy. The difficulties of actual building were, of course, increased in comparison with those of earlier ships, but the resultant gain was considerable. I submit, that we are very grateful to Major Flea for his most excellent paper.—*Engineering*, 21 July, 1922.

THE VINDICATION OF THE CAPITAL SHIPS.*—All doubt as to whether the construction of our two "post-Conference" battleships would be undertaken has now been set at rest by the first lord of the admiralty, who stated in the House of Lords on July 11 that the government had not reconsidered its decision to proceed with the building of these vessels, nor did it intend to do so. The necessary designs, he added, had already been worked out and approved, and were ready for the use of the builders. The actual date of laying down the ships is not yet known, but, according to the first lord's memorandum on the navy estimates, it will be "early next year." In the measured judgment of the admiralty it is feasible to make the new battleships "reasonably proof against any known likely methods of attack," an opinion which is based on the experience derived both from war operations and a long series of experiments presumably carried out since the war. In view of the high professional competence of the present board of admiralty—all of whose naval members saw prolonged service afloat in the late conflict—the public at large will be inclined to accept as final its verdict as to the indispensability of the capital ship True, it is warmly challenged by several naval officers of distinction, who believe the armored leviathan to have been rendered obsolete by submarine and aerial methods of offence, and support their thesis by arguments which might be conclusive if they rested on demonstrated fact instead of surmise As it is, however, the case for doing away with the battleship has not been proved, and in these circumstances the country is satisfied with the decision of the responsible controllers of its naval policy that two new capital ships shall be added to the establishment at an estimated total cost of £16,000,000. It seems an exorbitant sum to pay for only two ships, considering that eight pre-war *Dreadnaughts* could have been built for the same nominal outlay, but some allowance must be made for depreciation in the purchasing power of money. Probably, therefore, it is accurate to say that the cost of the battleship has doubled rather than trebled. Even so, there would be good reason to question the wisdom of spending so much money on new vessels of this type if it were certain that they could be destroyed as easily as their critics affirm. We are told, for instance, that "one bomb dropped by an aeroplane could sink the strongest battleship ever built or projected." No doubt it could, provided the ship was a stationary target, deserted by its crew, incapable of offering any active resistance, and that the aeroplane could drop a heavy bomb in the precise position where it would explode with maximum effect; but such a conjunction of favorable circumstances would be most unlikely to occur under war conditions.

It seems to us that critics of the battleship display too much imagination and too little regard for actualities. Although few of them appear to be aware of it, they are repeating much the same objections to the heavy ship as were raised in some quarters forty to fifty years ago, when the potentiality of the big gun and the torpedo was urged as a reason for building no more warships of large tonnage. Then, as now, the anti-battleship party was able to quote authenticated data in support of its views. As evidence that the heaviest ironclad might be wrecked by a single shot they pointed to the ease with which thick armor had been holed at the proving butts in England, France and Germany by the monster guns which each of those powers had constructed; while the resistance trials in England and similar experiments on the continent were

cited as confirmation of the theory that a single "fish" or spur torpedo could destroy the buoyancy of any man-of-war afloat. They either overlooked or discounted the fact that proving ground results were notoriously misleading as a guide to the performance of ordnance when mounted on shipboard and worked under battle conditions, just as they grossly exaggerated the chances of successful torpedo attack in the confusion and turmoil of a fleet action. As regards the first point a commentator of 1881 observed that "the superiority of the gun becomes much less marked under the practical conditions of a naval engagement. It is possible, as it has been shown, to penetrate the heaviest armor, but in experimental firing the targets are fixed at short distances and receive perpendicular blows from guns which can be laid with the utmost accuracy. These are conditions which can rarely obtain in an actual engagement." Subsequently the difficulties of carrying out torpedo attacks and the shortcomings of the new weapon were demonstrated by naval operations in the Black Sea and South American waters, and in the end the continued supremacy of the battleship was conceded by all save a negligible minority. The parallel between this early controversy and the one now in progress is sufficiently close to merit attention. Present-day opponents of the great ship are particularly impressed—or shall we say obsessed?—with the devasting effect of heavy aircraft bombs detonating below the water close alongside, as happened in the *Ostfriesland* trials. From what resulted on that occasion it was clear that serious damage had been inflicted. The *Ostfriesland* did, in fact, sink, but not so rapidly as to refute the suggestion that had there been a well-trained crew on board she might have been kept afloat. That the ship was perfectly motionless during the attack we know, and it is admitted that the airmen released their bombs from a height considerably less than they could have maintained with safety had they been under the fire of well-served anti-aircraft guns. On the whole, therefore, this particular experiment bore no more relation to war conditions than did the proving-ground artillery experiments or the torpedo trials of a generation ago, and it is not surprising that the admiralty should decline to abandon battleships merely on the strength of a single inconclusive demonstration. The matter would, of course, assume a very different complexion were it certain, first, that battleships will in future be frequently exposed to attack by the heaviest types of bombing aircraft: and, second, that a fair proportion of large bombs will fall on or close alongside the objective; but no such certainty exists. No doubt hits would be made from time to time, the effects of which might be disastrous, but in our judgment the contingency is not a sufficient pretext for discontinuing the building of large warships. The impression probably left in the mind of an uninstructed reader by much that has been written in the course of the newspaper controversy is that, prior to the advent of the submarine and the aircraft, battleships enjoyed almost complete invulnerability and were in no danger of that summary destruction with which they are threatened now. That, needless to say, is an entire fallacy. Large caliber projectiles containing a high-explosive charge have long represented a formidable menace even to stoutly armored chips, a menace which has become particularly serious since the introduction of the *Dreadnaught* type, with its large battery of heavy guns and the consequent development of salvo firing. Jutland furnished an object lesson on the tremendous power of modern naval artillery, for in that action several great capital ships were utterly destroyed by a few salvos of shell fired at long range. Whatever the anti-battleship school may assert to the contrary, it is none the less true that a large vessel can be made reasonably safe against under-water explosions by bulge and other forms of protection, which in a perfected form ought to confer the same degree of immunity against aircraft bombs as against

torpedoes. But it is practically impossible to design a ship which shall be impermeable to heavy gunfire. If, therefore, the gun platform can be made secure against exiguous attack below the water-line, there would seem to be no reason for doubting the continued primacy of the capital ship, which is essentially a platform for the carriage of heavy ordnance. Such security was declared to be attainable by Sir Eustace d'Eyncourt, the director of naval construction, in his paper at the recent Paris meeting of the Institution of Naval Architects, and is confirmed by Sir Philip Watts in his written remarks on that paper which we print today. We have no doubt this double assurance from two of our greatest warship designers will carry more weight with the public than unsupported statements to the contrary by critics of the admiralty's shipbuilding policy.

As we have remarked, the position today is fundamentally similar to that which existed nearly fifty years ago, when the advent of the locomotive torpedo raised doubt in many minds as to the expediency of continuing to build costly armorclads, and when ardent torpedoists were no less positive than our present-day aircraft enthusiasts that the great ship had lost its *raison d'être*. Naval opinion fortunately took the longer view, as in the main it does at the present juncture, with the result that Britain remained supreme on the ocean for a further generation by virtue of her splendid armor-clad fleet. We venture to think that the following words, spoken as far back as 1877 by the late Sir E. J. Reed in a discussion on "Warships and Torpedoes," are as apposite to the circumstances now prevailing as when they were uttered: "Here, then, we have every power furnished with the means of attacking our large warships, so cheap and so simple that few powers are too petty or too impecunious to provide them on an emergency, while the larger powers could, with the financial means at their disposal, completely compass and surround our few largest and finest ships with those agents of destruction. In my opinion this state of things imposes altogether new and solemn obligations upon our naval administrators, and the objects to which it points are clearly two-fold—first, the construction of our large ships on principles which make them as little destructible by torpedoes as by guns, which I believe to be quite possible; and, secondly, the building of all our other warships of small and handy types, and with the necessary improvements. With these objects neglected, we shall be placed in a position of serious disadvantage and danger; with these wisely and scientifically attended to, Britannia may in the coming days, as in the past, continue to rule the waves."—*The Engineer*, 21 July, 1922.

THE VULNERABLE PART OF A BATTLESHIP.*—Is armor plate no longer the index of a battleship's power or resistance? Has the airplane bomb made the lighting, communication and condenser systems of fighting craft the vital vulnerable parts of their equipment? These questions are receiving the most careful study by naval engineers throughout the world.

The main protective feature of the battleship, its armor plate, is no defense against the airplane bomb. This is conceded by those who are open-minded and want to know the truth. The huge appropriations for steel for this purpose may disappear in a few years if the power of aircraft is allowed to be tested.

It is a new fundamental in sea warfare that the vulnerability of a battleship to bomb attack bears no possible relation to its armor plate, as the armor plate does not perform any function in this respect. The armor plate only goes a short distance below the water line. Therefore, a bomb dropped in the water not far from the ship and exploding at a

* EDITOR'S NOTE. The above two editorials are reprinted with the view of calling attention to civilian estimates on the value of airplanes versus battleships.

depth of fifty or sixty feet, would act against the thin structural plate below the armor and on the bottom. This could not stand very much external pressure, being much less in structural strength than the hull of a submarine, and we know, from experiments, that a submarine can be sunk by an ordinary depth charge of three hundred pounds of T.N.T. exploding at a distance of three hundred feet. Such pressure is about 1,200 pounds to the square inch. It is therefore inevitable that an airplane bomb weighing four thousand pounds, with twenty-five hundred pounds of T.N.T. would sink any battleship now built or likely to be built, if exploded within a few feet of the hull.

The real points of attack of the airplane bomb are the structural plates on the bottom of a ship, and the lighting, communication and condenser systems of a battleship. These vital parts of any seacraft are not able to withstand earthquake shocks such as come from the heavy explosive charges of large bombs timed to explode alongside a ship.

The people of the United States should call on Congress to prove to them by experiments with old battleships properly strengthened that the present battleships and those building can withstand an attack from the air before more of the people's money is spent on vulnerable structures and, more important, before an enemy proves the truth of this fact by demonstration in time of war.—*Aviation*, 24 July, 1922.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"The United States Naval Railway Batteries in France"—Navy Department, Office of Naval Records and Library, *Publication Number 6*.

"Naval Construction" (Illus.)—*The Shipbuilder*, May, 1922.

"Coastal Motorboat for the French Navy" (Illus.)—*Engineering*, 5 May, 1922.

"The Testing of Materials for Shipbuilding"—*The Engineer*, 14 July, 1922.

"An American High Speed Cruiser and its Prototype" (Illus.)—*The Engineer*, 21 July, 1922.

"The Scientific Control of Combustion" ("W. R." CO_2 Recorder)—*The Marine Engineer and Naval Architect*, July, 1922.

"The protection of Metals from Oxidation at High Temperatures"—*The Marine Engineer and Naval Architect*, July, 1922.

"Foreign Gas in the Refrigerating System"—*Power*, 25 July, 1922.

"Lubricating Reduction Gears"—*Power*, 25 July, 1922.

"Tubular Oil Cooler" (Illus.)—*Engineering*, 21 July, 1922.

"Oil Engine vs. Steam Power"—*Power*, 18 July, 1922.

"Self-Steering Vessels" (Application of Gyro Compass)—*Scientific American*, August, 1922.

"Variable Factors in Aerial Bombing"—*U. S. Air Service*, August, 1922.

"An Explanation of Soaring Flight"—*Aviation*, 31 July, 1922.

"Some Forced Plane Landings in Santo Domingo"—*Marine Corps Gazette*, June, 1922.

"The Brown Resistance Thermometer" (How such instruments work)—*Power*, 18 July, 1922.

"Physics of the Three Electrode Tube"—*Journal of the Franklin Institute*, July, 1922.

"220,000 Volt Transmission and Apparatus"—*The Engineering Journal*, June, 1922.

"Description of the 45,000 k.w.a. Queenston Generator"—*Journal of the American Institute of Electrical Engineers*, June, 1922.

"Queenston-Chippewa 55,000 Horsepower Hydraulic Turbines"—*Power*, 11 July, 1922.

"The Wilson Dam at Muscle Shoals"—*Army Ordnance,* May-June, 1922.

"Our National Military Policy," by General John J. Pershing—*Scientific American,* August, 1922.

"The Strongest Navy," by Rear Admiral Bradley R. Fiske—*Current History,* July, 1922.

"Japan's Naval Mastery in Asia," by G. Schornstheimer—*Current History Magazine,* August, 1922.

"The Philippines and Sea Power," by W. H. Gardiner—*North American Review,* August, 1922.

"Supply of Bulk Stores in War," by Lieutenant Colonel Sewell—*Royal Engineers Journal,* July, 1922.

French Naval Publications:*

"La Guerre des Croisseurs" (4 August to Falkland Islands, Vol. I, 4 August to 1 October) by Capitaine de Frigate P. Chock (with 9 maps, 60 fr.)

"La Défense des Frontieres Maritimes," by Capitaine de Corvette J. Avice (16 fr.)

"La Guerre Sous-Marine," by Capitaine de Corvette A. Laurens, Chef de Service Historique (with 13 cuts, 70 f.)

* These works are published by Augustin Challamel, 17 Rue Jacob, Paris.

NOTES ON INTERNATIONAL AFFAIRS

FROM JULY 5 TO AUGUST 5

PREPARED BY

ALLAN WESTCOTT, Professor, U. S. Naval Academy

GERMAN REPARATIONS

REQUEST FOR MORATORIUM.—On July 12 Germany presented to the Reparation Commission a formal request for complete relief from all cash payments of indemnity until January, 1923. In reply the commission insisted upon prompt payment of the 32,000,000 gold marks due on July 15 (after a reduction of 18,000,000 marks for delivery of coal and dyes), and set August 15, as the date for a decision on the question of a moratorium. The Special Commission on Guarantees returned to Paris from Berlin, and on July 19 reported that Germany had consented to Allied supervision of German finances, including budget, exports and imports, publication of statistics, and recovery of evaded capital. In view of this attitude on the part of Germany, it was thought a majority of the Reparation Commission would report favorably on delay or reduction of indemnity payments.

REDUCED PRIVATE DEBT PAYMENTS DENIED.—At the same time as her request for a reparations moratorium, Germany presented directly to France a request for reduction from $10,000,000 to $2,000,000 of the monthly payments pledged by the German Government on debts of German nationals to Allied citizens contracted prior to the war. This request France refused in a sharp note setting 10 days as a limit for Germany to signify continuance of full payments. Upon a subsequent German refusal, France sent a 4-day ultimatum, with threats of seizure of German property in case of failure to comply.

MEETING OF PREMIERS ON AUGUST 7.—At the close of July, Premier Lloyd George sent to Premier Poincaré, and also to the Belgian and Italian Governments, invitations to a conference in London on Aug. 7. The chief business of the conference was to be the question of delayed or reduced payments on the German indeminty, though the Tangier and Near East questions were also up for consideration.

ENGLAND DEMANDS PAYMENT.—In an important note sent to France and other powers on August 1, the British Government declared that, in view of the insistence of the United States on payment of the British debt,

Great Britain would be forced to insist on payment of debts owing to her, though she would have preferred a policy of general cancellation. The note, apparently intended for American reading, is summarized as follows:

London, August 1 (Associated Press).—The British Government cannot treat the repayment of the Anglo-American loan as if it were an isolated incident in which only the United States and Great Britain had any concern, said the note addressed by the Earl of Balfour to France, Italy, Jugoslavia, Romania, Portugal and Greece.

Declaring it is regretfully constrained to request the French Government to make arrangements for dealing to the best of its ability with the Anglo-French loans, the British Government says it desires to explain that the amount of interest and repayment for which it asks depends less on what France and the other allies owe Great Britain than on what Great Britain has to pay to the United States.

The policy favored by his Majesty, the note states, is that of surrendering Great Britain's share of German reparations and writing off, through one great transaction, the whole body of interallied indebtedness.

"But if this is found to be impossible of accomplishment," the note says, "we wish it to be understood that we do not, in any event, desire to make a profit out of any less satisfactory arrangement. In no circumstances do we propose to ask more from our debtors than is necessary to pay our creditors.

"And while we do not ask more," it continues, "all will admit that we can hardly be content with less; for it should not be forgotten, though it sometimes is, that our liabilities were incurred for others, not for ourselves."

Pointing out in conclusion that it is not merely a question among the Allies, because former enemy countries also are involved, and the greatest debtor is Germany, the note declares that the government does not suggest, either as a matter of justice or expediency, that Germany should be relieved of her obligations to the other Allied States. But Great Britain would be prepared, subject to the just claims of other parts of the Empire, to abandon all further right to German reparations and all claims to repayment by the Allies provided this renunciation should form a part of a general plan whereby this great problem could be dealt with as a whole and a satisfactory solution found.

A general settlement, in the view of the British Government, the note says, would be of more value to mankind than any gains that could accrue from the most successful enforcement of legal obligations.

GERMANY

BAVARIA ASSERTS STATE RIGHTS.—The German Government was in difficulties at the close of July, over the refusal of Bavaria to enforce the stringent federal laws recently enacted for safeguarding the republic, and directed against monarchist activities. Bavaria objected chiefly to what she regarded as federal interference and especially to the provision for the trial of offenders under the new act in a special federal court of Leipzig. Instead of promulgating the law, therefore, she proclaimed modified ordnances of her own.

Bavaria's action appeared in violation of Article XIII of the Weimar Constitution providing that "Reich's law breaks land law" (i. e., law of individual states). President Ebert evaded a crisis by sending a letter to

Premier Lerchenfeld of Bavaria on July 27, citing the power of the Reich to make null and void the measure adopted by the Bavarian Diet, and calling upon the Bavarian Premier to consider whether it was not possible to avoid this action. A federal court at Munich was feasible if this offered a solution.

GREAT BRITAIN AND IRELAND

CIVIL WAR IN IRELAND.—Following the downfall in Dublin of forcible resistance to the Free State Government, the center of hostilities shifted to Limerick and Southwestern Ireland. Limerick and also Waterford fell to the government forces on July 21. The Free State Troops attacking Limerick were estimated at about 700 and the irregulars about 1,000. Subsequently the government forces reported slow but steady progress, and strong support from the civil population. On July 30, they captured Tipperary and were closing in on Kilmallock.

ITALY AND THE NEAR EAST

FACTA CABINET REORGANIZED.—The Facta Cabinet in Italy resigned July 19, after 4 months' existence, during which the chief event was the Genoa Conference. Its overthrow was accomplished by a combination of Socialist, Democratic, and Catholic parties, the latter withdrawing their support owing to the government's failure to take stronger measures against the Fascisti.

Great difficulty was experienced in organizing a new ministry owing to the inability of leaders to get parliamentary support for a strong policy against either of the extreme elements in Italy—Fascisti on the one hand and Communists on the other. The Fascisti leader Mussolini on July 19 threatened open insurrection, declaring no cabinet that employed force against the Fascisti could rule in Italy. On the opposite side, the Socialists blocked ex-Premier Orlando's efforts to form a new cabinet by insisting that it be made up entirely from the parties by which the former cabinet had been overthrown. The old Facta Cabinet was finally reorganized, with ten members retained and five new ones added, without much change in its political alignment.

GREEK THREATS IN THE NEAR EAST.—On July 27, the Greek Government sent a note to the Allied powers declaring its intention to resume entire liberty to take what steps it thought fit, to end the war on the Turkish nationalists. At the same time troops to the estimated number of 25,000 were concentrated at the port of Rodosto and 70,000 along the whole Thracian front in an apparent threat against Constantinople.

Allied forces in the city (about 10,000 in addition to the British squadron) at once took precautionary measures, and the Allied Governments sent warnings to Greece. On July 31, Premier Lloyd George announced that Greece had reaffirmed her promise not to invade the neutral zone without the consent of the powers.

On July 30, Greece issued a proclamation declaring a regime of self government in the regions of Asia Minor occupied by the Greek troops, the new state to be known as Occidental Asia Minor. This move was contrary to the Allied peace proposals of last March, which provided for complete Greek evacuation.

These measures of King Constantine's Government were interpreted as efforts on his part to bolster up his power at home by assuming an aggressive policy abroad.

RUSSIA AND NORTH EUROPE

CLOSE OF HAGUE CONFERENCE.—On July 16, when the Hague Conference on Russia was on the point of breaking up, the Russian delegates put forward new proposals in the form of a request for a statement of the total amount of compensation desired for foreign property in Russia, and an agreement to settle these claims so far as possible. The letter suggested that 90% of the claims could be settled by direct negotiations with private claimants. This new offer, though apparently indicating a shift of position on the part of the Soviet Government, served only to prolong the conference four days. The rejection of the Soviet proposals and the closing of the conference came on July 20, through the discovery that they called for *de jure* recognition of the Soviet Republic and for individual negotiations in each case between private claimants and the Soviet Government, with no guarantee of satisfactory settlement of claims.

"The task of the Hague," said Sir Philip Lloyd Greame, the British expert, "was to get a bilateral agreement with detailed provision for guarantees and with assurances to the non-Russian powers that the agreement would be carried out, but the Bolshevist Government insisted on treating with the people and taking matters out of the hands of the government."

"The Hague conference," continued Sir Philip, "brought the Russian Government face to face with actualities as never before. It has shown Russia the willingness of other countries to co-operate with her, while at the same time showing the inevitable character of the economic forces which govern co-operation.

"If Russia decides to pursue the policy foreshadowed by the Russian delegation, she will not merely be entering on a path to bring her back into the community of nations, she will be setting out on the road to the complete restoration of her economic life."

The conference in closing adopted a resolution pledging the powers represented to use their influence with their nationals to prevent the latter from accepting concessions in Russia involving property formerly belonging to foreigners without the consent of these former owners.

POLISH CABINET CRISIS.—After the Ponikowski cabinet in Poland was forced to resign by President Pilsudski on June 2, there was a two months' struggle for supremacy between president and parliament. Two efforts to form a cabinet without a parliamentary majority ended in failure. On July 30, the president gave in to the will of the Nationalist majority in

the Diet by calling on Dr. Nowak, rector of the University of Cracow, to organize a ministry.

The fall of the Ponikowski cabinet ended the work of two able leaders—Michalski, who set Poland on her feet financially; and Foreign Minister Skirmundt, who secured alliances with the Baltic States and with the Little Entente. Poland elects her first constitutional president this autumn.

RECOGNITION OF BALTIC STATES.—A the close of July, the United States Government announced its decision to recognize the Baltic republics formed since the war from former Russian territory. These republics include Lithuania, Latvia and Esthonia. Finland was recognized some months ago.

LEAGUE OF NATIONS

APPROVAL OF MANDATES.—At the special (nineteenth)' session of the League of Nations Council which opened in London on July 17, the mandate terms offered by France and Great Britain in the Near East were the special subject for consideration. Both the British mandate for Palestine and the French mandate for Syria were formally approved on July 24, to go into force after settlement of certain questions at issue between France and Italy over the rights of Italian nationals in Syria. Speaking of Arab objections to the Palestine mandate, the Earl of Balfour declared the Arabs were fully protected and would secure liberty undreamed of under Turkish rule.

AMERICAN ATTITUDE TOWARD LEAGUE.—In an exchange of letters in July, with Hamilton Holt, Secretary Hughes defined and defended the policy of the present United States Administration toward the League of Nations. Secretary Hughes justified the separate treaty with Germany, cited the accomplishments of the Washington Conference in the direction of peace, and presented evidence to show that, while protecting American rights, the government had not needlessly delayed the execution of the mandate policy. In a letter dated July 19, Mr. Hughes said in part:

"In your observations you seem to imply that I have been invested with some authority to make this government a member of the League of Nations upon such reservations as I might propose. If you have any such notion, I must ask you to disabuse your mind of it. Entrance into the League of Nations upon any conditions could be accomplished only by treaty, and treaties cannot be made except in the constitutional manner.

"It is idle to propose what it is found cannot be effected. That it is not the way to make progress internationally or otherwise. What I said with respect to the treaty with Germany is applicable.

"Really I cannot see any reason why you should address me in the manner you have chosen, in view of the fact that the atttitude of the administration upon the subject was frankly and definitely stated in President Harding's message to Congress in April, 1921.

The secretary then quoted the President's speech condemning the League because linked with the Versailles Treaty, and declaring our willingness to

enter an "association to promote peace" for all nations without surrender of national sovereignty.

PLAN FOR DISARMAMENT.—On July 4, before the special League Commission on Disarmament, Lord Robert Cecil presented a draft treaty for reduction of armaments.

As a preface to his proposal, the British representative laid down five principles which provide an interesting amendment to the famous Article X of the Covenant of the League. These principles are as follows:

"1. No scheme for reduction of armaments can be effected which is not a general one.

"2. In the present state of the world no government could accept responsibility for a serious reduction of armaments unless it received some satisfactory guarantee of safety for its country.

"3. Such guarantee can be found only in a defensive alliance of all the countries concerned, binding them to come to the assistance of any one of them if attacked. It should be provided that the obligation to come to the assistance of an attacked country should be limited to those countries which belong to the same quarter of the globe.

"4. In cases where for historical, geographical or other reasons a country is in special danger of attack, detailed arrangements should be made beforehand for its defense.

"5. It is understood that all of the above resolutions are conditional on a reduction of armaments to an agreed scale being carried out and on the provision of effective machinery to insure such reduction being made and maintained."

PLEDGE OF MUTUAL SUPPORT

These five resolutions, Lord Robert said, contained the essential element of his plan, but for purposes of elucidation he had drafted them into the form of a treaty which provides that "the high contracting powers hereby agree that if any one of them is attacked all the others will forthwith take such action as they may have agreed upon under Article IV of this treaty. This obligation, however, shall not come into force unless the naval, military and air forces of the party attacked shall have been reduced in accordance with the terms of the treaty."

Article IV reads:

"In the event of any of the high contracting powers regarding itself as menaced by the preparations or action of any other state, whether a party to this treaty or not, it may so inform the secretary general of the League, who shall forthwith summon a meeting of the council of the League, and if the council by not less than a three-fourths majority shall be of the opinion that there is reasonable ground for thinking that said preparations or action do constitute a menace as alleged they shall report such representations to the government creating the menace in respect of such preparations or action as they may think right, and shall direct the permanent Military Commission of the League to submit plans for assistance to be given by the high contracting powers to the party menaced.

"Such plans if approved by three-fourths majority of the council shall become binding on the high contracting powers.

"Neither under this nor any other article of this treaty, however, shall any of the high contracting powers not being a European state be bound to furnish any naval, military or air force in Europe; or not being an American state, in America; or not being an Asiatic state in Asia; or not being an African state, in Africa."

Other articles in the draft provide for the right of inspection by League Commissioners of the armament situation, and a clause is added that nothing in this treaty shall be deemed to diminish the provisions in the covenant for maintaining the peace of the world.

For the present Lord Robert accepted as a compliment to his proposal the disarmament scheme proposed at the last meeting by Lord Esher, which provides that the restriction of land armaments be fixed by ratio, following the naval precedent at Washington. In this scheme Lord Esher fixed the unit for military and air forces at 30,000 men, with co-efficient, as follows: Belgium, 2; Czecho-Slovikia, 3; Denmark, 2; France, 6; Great Britain, 3; Greece, 3; Italy, 4; Jugoslavia, 3; Poland, 4; Rumania, 3; Spain, 3; Switzerland, 2.

Some discussion took place on Lord Robert's scheme and it was then referred to a subcommission to be examined in detail.—*New York Times,* 5 July, 1922.

The Cecil plan was subsequently adopted by the commission for presentation to the League Assembly in September. The Chilean representative on the commission also stated that the whole question of military and naval disarmament would be laid before the Fifth Pan-American Conference at Santiago, next March.

GERMANY NOT TO ENTER LEAGUE.—Following Premier Lloyd George's statement that it was desirable that Germany should enter the League of Nations at the next assembly, Premier Poincaré intimated that Germany's entry should be delayed until she had given, in the language of the League Convenant, "effective guarantees of her sincere intention to observe her international obligations." Later it was said that the British premier would make the admission of Germany a condition to the proposed cancellation of the French debt.

In view of the French attitude, Germany manifested no eagerness to apply for admission, apparently satisfied to remain outside in the company of the United States.

UNITED STATES AND LATIN AMERICA

PHILIPPINE APPEAL FOR INDEPENDENCE.—To the Philippine appeal for independence, supported by every member of both houses of the Philippine Legislature and presented in July, President Harding replied that, with every regard for Philippine achievements, aspirations, and loyalty, the time was "not yet ripe for independence."

In press comments, the McEnery Resolution (accompanying ratification of the peace treaty with Spain) was quoted as evidence of our promise of independence, and the assertion was made that failure to carry out this promise would mean insurrection. It was noted also that aside from their strategic importance, the Philippines contained valuable raw materials including vast quantities of hardwood, and practically all the hemp in the world.

CANADA FOR PERMANENT PEACE TREATY.—On July 12, Premier Mackenzie-King and Minister of Defense Graham of Canada called on Secretary

Hughes in Washington to propose a new treaty between the United States and Canada perpetuating the ideas of the Rush-Bagot Agreement, now 105 years old, and providing for permanent peace without defenses on the United States–Canadian frontier. In Washington the proposal was favorably received and a treaty anticipated.

TO END CONTROL IN DOMINICA.—On July 4, Secretary Hughes issued a statement announcing the conditions under which American military forces and administration would be withdrawn from the Dominican Republic. The statement referred to the proclamation made by Admiral Robinson in June of 1921 which it had been impossible to carry out, and declared that the present plan was based on conferences with Dominican leaders. It provides for: (a) a provisional government which will appoint a cabinet to take over executive duties; (b) concentration of American forces at from one to three points, and maintenance of order by the Dominican National Police; (c) a convention with the United States recognizing the validity of orders and bond issues under the American administration, and enforcement of the Convention of 1907, so long as any bonds of the issues of 1918 and 1922 remain unpaid; (d) withdrawal of American forces after a general election and assumption of office by a constitutional president.

To ascertain whether this plan met the approval of the Dominican people, Mr. Sumner Welles of New York was appointed envoy extraordinary to investigate and report on political conditions in Dominica.

TACNA-ARICA ARBITRATION AGREEMENT.—To end the deadlock in the conference between Chili and Peru over the Tacna-Arica dispute, Secretary Hughes in June made proposals for arbitration. On July 17, it was announced that these proposals were acceptable to both States in the following modified form:

"That the arbitrator decide whether a plebiscite shall be held in the disputed province of Tacna-Arica, as originally provided by the Treaty of Ancon.

"That in case a plebiscite is decided on, the arbitrator shall fix the conditions under which it is to be held.

"That if the decision is against a plebiscite, Chili and Peru will enter into direct negotiations to decide to whom the province belongs, and that in the event these direct negotiations do not result in an agreement within a specified time, both sides will request an exercise of good offices by the United States to aid in a settlement."—*Literary Digest*.

YAP TREATY PROCLAIMED.—On July 17, the United States Government proclaimed the Yap treaty as in full force, and for the first time published the complete text.

The text of the treaty proper provides:

"Subject to the provisions of the present convention, the United States consents to the administration by Japan, pursuant to the aforesaid mandate,

From the Chicago "Tribune."

TACNA AND ARICA

of all the former German islands in the Pacific Ocean lying north of the equator."

Article II provides that the United States and its nationals shall receive all the benefits of the engagements of Japan defined in Articles 3, 4 and 5 of the mandate, notwithstanding the fact that the United States is not a member of the League of Nations. These articles of the mandate prohibit the slave trade or forced labor, prohibit military training of natives otherwise than for internal police purposes and local defense of the territory, and prohibit the establishment of military or naval bases or fortifications.

It is further agreed between the high contracting parties, the treaty sets forth, as follows:

1. Japan shall insure in the islands complete freedom of conscience and the free exercise of all forms of worship which are consonant with public order and morality; American missionaries of all such religions shall be free to enter the islands and to travel and reside therein, to acquire and possess property, to erect religious buildings and to open schools throughout the islands: it being understood, however, that Japan shall have the right to exercise such control as may be necessary for the maintenance of public order and good government and to take all measures required for such control.

2. Vested American property rights in the mandated islands shall be respected and in no way impaired;

3. Existing treaties between the United States and Japan shall be applicable to the mandated islands;

4. Japan will address to the United States a duplicate of the annual report on the administration of the mandate to be made by Japan to the council of the League of Nations;

5. Nothing contained in the present convention shall be affected by any modification which may be made in the terms of the mandate as recited in the convention unless such modification shall have been expressly asented to by the United States.

Article III provides:

The United States and its nationals shall have free access to the island of Yap on a footing of entire equality with Japan or any other nation and their respective nationals in all that relates to the landing and operation of the existing Yap-Guam cable, or of any cable which may hereafter be laid or operated by the United States or by its nationals connecting with the Island of Yap.

The rights and privileges embraced by the preceding paragraph shall also be accorded to the government of the United States and its nationals with respect to radio telegraphic communication; provided, however, that so long as the Government of Japan shall maintain on the Island of Yap an adequate radio-telegraphic station co-operating effectively with the cables and with no other radio stations on ships or on shore, without discriminatory exactions or preferences, the exercise of the right to establish radio-telegraphic stations on the island by the United States or its nationals shall be suspended.

Article IV declares that in connection with the rights embraced by Article III specific rights, privileges and exemptions, in so far as they relate to electrical communications, shall be enjoyed in the Island of Yap by the United States and its nationals.

No censorship or supervision is to be exercised over cable or radio messages or operations.

Nationals of the United States are to have complete freedom of entry and exit in the islands for their persons and property.—*New York Times*, 18 July, 1922.

FAR EAST

CONDITIONS IN SOUTH CHINA.—On July 15, it was reported that four of the naval vessels controlled by Sun Yat-sen at Canton had deserted, leaving only two cruisers, two destroyers, and two transports under his orders. According to a despatch of August 2, President Sun's long expected troops had returned from the North and were defeated in an attack on General Chen Chiung-ming's lines, 130 miles north of Canton.

In Manchuria the defeated General Chang Tso-lin had made new alliances with the Anfu leader, Tuan Chi-jui, and with Sun Yat-sen, and had forced General Wu to resume active military operations. The Chinese parliament met on August 1, with members in attendance sufficient for a quorum. Parliament and President Li Yuan-hung were reported in agreement over the adoption of a permanent constitution for China.

WARNING FROM JAPAN TO CHINA.—Early in July, the Japanese government issued a warning to China that unless the Chinese Government took adequate steps to prevent the recurrence of outrages against Japanese in Manchuria, Japan would despatch troops from Korea and assume responsibility for the protection of its nationals. Bandits, on June 28, raided

the Manchurian town of Tou-tae-kon, near the Korean border, set fire to the Japanese consulate, and killed two Japanese, one Korean, and three Chinese. This, according to the Japanese statement, was the third affair of this kind since September, 1920.

JAPANESE POLICY.—Mr. Isaac F. Marcosson, American correspondent in the Far East, upon his return in July, expressed the view in the *New York Times,* that Japan had actually changed her policy toward China from aggressive penetration to the cultivation of friendly feeling. He declared that the Japanese economic situation made it impossible for her to continue her aggressive policy or wage war on a modern scale. Retrenchment was essential to avoid national bankruptcy.

Regarding China, he believed General Wu Pei-fu to be an honest and strong leader, but "unification of China will be a slow process because of endless jealousy and corruption."

REVIEW OF BOOKS

THE FLIGHT OF THE "GOEBEN" AND "BRESLAU," by Admiral Sir Berkely Milne, Bart., G. C. V. O., K. C. B. London. Eveleigh Nash Co., Ltd., 1921.

Early in the war referring to the conference in Paris between Lord Kitchener and General French, M. Millerand said, *"il ne faut pas encombrer nos generaux de suggestions."* That the British Admiralty held a contrary opinion is apparent in all the naval campaigns of the war beginning with the *Goeben* affair—where to use Sir Julian Corbett's expression the admirals were "bewildered" by instructions from London. No one can read Admiral Milne's presentation of the case without being impressed with the fact that the Admiralty and not the commander-in-chief directed the *Goeben* campaign, which had such unhappy results, but for which the admiral was responsible.

Admiral Milne's account of what he calls the "flight" of the German ships is written from his viewpoint as commander-in-chief, and is really his Apologia. The story is told in the simple, straight-forward language of the quarter deck, with courteous avoidance, even by implication, of criticism of any one under his command, but without attempt to conceal his irritation with Sir Julian Corbett, the official historian of the war, and with the Admiralty for permitting the publication of what he deems inaccuracies, in Sir Julian's narrative,[1] notwithstanding their disclaimer of responsibility for the author's opinions.

After the *Goeben* affair stories were current in the press, that the Germans had outwitted the British naval officers by sending out false messages in admiralty code, and there was another story that when the German ships left Messina for the dash to Constantinople, the flagship's band was left ashore to deceive passing ships by the music. These stories lack verification, but are worth mentioning, especially the first, in view of what Admiral Milne calls the "mistaken" telegram which he received on August 9.

In 1916 and again in 1919 the question of responsibility for the escape of the *Goeben* was brought up in the House of Commons, but it was shown that the "conduct and dispositions" of Admiral Milne had been approved by the Admiralty. The commander of the First Cruiser Squadron was, on the recommendation of a Court of Inquiry, brought to trial by General Court Martial, and was "fully and honorably acquitted." When Admiral Milne retired from active service in 1919, the Admiralty

[1] Naval Operations, Vol. I, Chapter III.

published a statement completely exonerating him from all blame. Official vindication can go no farther.

It will not detract from the interest of Admiral Milne's book to outline his account of this momentous naval adventure with its far-reaching results.

When the commander-in-chief was informed by the Admiralty that the *Goeben* was his paramount objective and that he was to shadow her wherever she went, he sent the First Cruiser Squadron to watch the Straits of Otranto, established a patrol in Malta Channel, and dispatched a swift light cruiser to examine the Straits of Messina. It is well to bear in mind that both the Admiralty and commander-in-chief were convinced that the Germans would try to get into the Atlantic Ocean. No one apparently considered the Dardanelles as a probable or possible refuge.

In addition to his main task in connection with the *Goeben*, Admiral Milne was instructed to look out for the Austrian fleet and to afford protection to the French transports from Algeria. He was ordered to remain at Malta himself; he was cautioned not to engage a superior force, and later when Italy announced her neutrality he was directed to keep his ships out of the six-mile limit of her coast.

Although he was continuously receiving orders and instructions from the Admiralty, his greatest handicap was lack of information. The Germans apparently used the Italian wireless freely, but the British commander-in-chief could not, or at least did not, receive any information from the British agent at Messina until after vexatious delays, and he had difficulty in establishing wireless communication with the French admiral.

The German division left the Adriatic, coaled at Brindisi, and proceeded to Messina without the movement being known to the commander-in-chief until much later. As a matter of fact the ships were not definitely located by the British until the *Indomitable* and *Inflexible* ran into them off the east coast of Sicily in the forenoon of August 4.

The British ships were on their way at high speed to Gibraltar to assist in guarding the Straits, and the Germans who had coaled at Messina had just bombarded the Algerian coast towns of Bona and Phillipville. The Germans were standing to the eastward and edged off to the northward when they sighted the British. The latter closed in, and the ships passed each other on opposite courses at a distance of 8,000 yards, without saluting but with guns trained fore and aft. The stage was set for a mighty fine sea fight, one that would have had a unique place in history, but at the moment war was not declared—fifteen hours later[2] the meeting would have had a different ending! On cannot help wondering however what would have been the result if the British ships, disregarding the formality of a declaration of war, à la Japanese, had sunk the Germans then and there. But as O. Henry remarks, what's the use!

[2] At fifteen minutes past one, August 5, on the night of August 4-5, I received the order to commence hostilities against Germany. Admiral Milne, (p. 71).

Under the circumstances there was then nothing for Captain Kennedy in the *Indomitable* to do but to swing around and "shadow," but as the German ships had the heels of the British, the latter were unable to keep up, and the Germans made for Messina where they arrived next morning. It would seem that the fox was caught. But after coaling from German colliers, and at 5 P. M., August 6, Admiral Souchon began his memorable dash for Constantinople, accompanied by the *Breslau*. The German armed auxiliary *General* sailed with them, but took a different route, running to the southward along the coast of Sicily and arrived at Smyrna the ninth of August without having been seen.

After the British ships lost sight of the *Goeben* the commander-in-chief naturally assumed that she would make for Messina, and accordingly the *Gloucester* was detailed to watch the southern approaches of the Straits, while with two battle cruisers and two light cruisers he patrolled on a north and south line north of Bizerta. At this time the *Indomitable* was coaling at Bizerta and the First Cruiser Squadron and destroyers were off Cephelonia.

This disposition of the British Forces was subsequently approved by the Admiralty. However, as the commander-in-chief had known since August 4 that the French admiral was at Bizerta, and that on the night of August 6-7 the latter had offered him a squadron of cruisers, it seems strange that he himself did not take up a central position near Malta, where he would have been in the best position to support either Troubridge to the eastward or his French colleague to the westward, as occasion might acquire. It was certain that the combined French and British forces thoroughly protected the westward area if the Germans attempted to break into the Atlantic; the weak part of the net was to the eastward. And it happened, at 6 P. M., August 6, the alert *Gloucester* sighted the *Goeben,* followed by the *Breslau* coming down through the Straits. Had the commander-in-chief been near Malta, which is about 120 miles from Messina, the Germans must have been inevitably intercepted and caught between him and the First Cruiser Squadron. As it was when the admiral received the *Gloucester's* report about 11 P. M. that the Germans were again at sea, he himself in the *Inflexible* was off the northeast point of Sicily, 180 miles from the northern entrance of the Straits; even if he had disregarded the Admiralty's order to keep out of territorial waters of Italy (which was cancelled four hours later) and pursued through the Straits it would have been a useless stern chase.

So the commander-in-chief returned around the west coast of Sicily and arrived at Malta with the *Inflexible* and *Indefatigable,* where at noon on Friday, August 7, later he was joined by the *Indomitable,* and these ships sailed thence to the eastward early on August 8, at a speed of about ten or twelve knots, the squadron having been detained several hours by boiler repairs in the *Indomitable.*

When the *Gloucester,* lying ten miles off Taormina, sighted the *Goeben* standing out around the Calabrian coast, followed by the *Breslau* astern,

Captain Kelly lost no time. Skillfully working his way inshore of the Germans deliberately and gallantly passing within gun range of the *Goeben,* he put them in the moonlight, while he hugged the shadows of the shore line. Once the *Breslau* tried to pinch him inshore, and once she tried to provoke him to action by crossing his bows and passing within 4,000 yards of him, but with splendid self-control he reserved his fire, and held on to the *Goeben.* Shortly afterwards the *Breslau* disappeared to the southward and eastward, presumably to scout ahead. At 11 P. M. Admiral Souchon turned to the southward and eastward and Captain Kelly reported the change of course, but unfortunately Troubridge thought it was a blind, and held on to his leisurely patrol to the northward to watch the entrance to the Adriatic, should the *Goeben* attempt to enter the Straits of Otranto. An hour later, becoming convinced that the change to the southward was not a feint, the rear admiral turned to the southward at midnight (6-7) to intercept the *Goeben* which at that moment was only 120 miles away. He was on interior lines and converging, and as he must have known continuously from Captain Kelly the exact position of the Germans, it is not clear why he did not hold on, make a torpedo attack before daylight, and follow it up if necessary with a ship action. His eight destroyers well handled would have easily and quickly accounted for a fleeing ship at night whose position was accurately known. In the mêlée of Heligoland, August 28, the destroyers made history even when short of coal and ammunition. However the commander of the First Cruiser Squadron decided that the *Goeben* was a superior force—as she was if destroyers are excluded from the count—and as his orders forbade engagement with a superior force, about four o'clock (August 7) he hauled off, and proceeded to Zante, where he anchored at 10 A. M., the *Goeben* at that time passing only 42 miles distant, still trailed by the gallant *Gloucester.* The *Breslau* rejoined her consort at 10:30 A. M.

About 1 P. M. in order to check the *Goucester,* the *Breslau* began to drop astern, and then Captain Kelly decided in turn to bring her to action for the purpose of checking the *Goeben,* and giving the First Cruiser Squadron time to catch up, not knowing the latter had abandoned the chase, "or to be more exact, that he had abandoned his intention of intercepting them and bringing them to action." To this end the *Gloucester* turned to the northward and eastward and brought the *Breslau* on his starboard quarter and opened fire. As he anticipated the *Goeben* turned sixteen points to drive off the *Gloucester,* but after the two small ships had exchanged several shots, and the *Goeben* had fired several at long range, she resumed her course to the southeastward followed by the *Breslau,* and again by the *Gloucester,* until off Cape Matapan when the *Gloucester* at 4:40 P. M. was recalled by the commander-in-chief, and the Germans passed through Cervi Channel into the Aegean Sea.

The commander-in-chief had previously ordered Captain Kelly to drop astern and avoid action, but according to Corbett, "Captain Kelly considered these orders 'permissive,' not mandatory, and held on and did

just what he was told not to do. There is a fine Nelsonian touch in this, worthy of emulation."

For his splendid conduct in this affair Captain Kelly was decorated with the Order of Companion of the Bath.

Now occurred an incident which completely upset the plans of the commander-in-chief. In the forenoon (8th) he received a radio to begin hostilities against Austria. He immediately headed up to the northward and eastward to effect a rendezvous with the rear admiral off the mouth of the Adriatic, but at 2 P. M. he received another radio negativing the first one. He was now a bit suspicious, and asked confirmation of the second message, and this was received about six o'clock. At noon the next day he received definite word from the Admiralty that England was not at war with Austria, and to continue the pursuit of the *Goeben*.

In justice to the commander-in-chief it must be recorded that the destroyers were short of coal, and that the colliers sent by him did not reach the commander of the First Cruiser Squadron until August 8. The failure to coal the destroyers was largely responsible for the escape of the Germans for they could neither attack nor search, and as attendants of the Cruiser Squadron were entirely useless without coal. Admiral Milne does not discuss the responsibility for this fatal neglect. His only comment is "the collier *Vesuvio* had already (2 P. M., August 8) arrived at Port Vathe, Ithaca, unknown to the rear admiral." Three more colliers arrived the next day but then it was too late.

At the time the commander-in-chief resumed his search for the *Goeben*, that ship was coaling in the island of Denusa about 350 miles distant. He proceeded down the coast towards Cape Matapan with the three battle cruisers and the *Weymouth*, speed ten knots. He had no destroyers with which to scout and search and only one light cruiser, the others not having come up. As he remarks, "to search for ships of superior speed among the islands of the Aegean Sea with battle cruisers alone would have been an insane proceeding."

It is futile to follow the battle cruisers farther. No one dreamed that Constantinople was the goal of the Germans. The commander-in-cheif guessed Salonika, some Greek port, Alexandria, or even a turn westward to Gibraltar. He was deceived also by the apparent direction of the *Goeben's* wireless, as well as that of the *General*, which ship had made a wide sweep, and reached Smyrna without molestation.

While cruising and searching on a radius of sixty miles off Cape Malea, the commander-in-chief received at 10:30 A. M. August 11, the disconcerting telegram from Malta that the *Goeben* and *Breslau* had entered the Dardanelles at nine o'clock the night before. The fox had escaped.

Opinions will vary as to the conduct of this brief but momentous campaign in the Mediterranean, but there can be no question as to the skill and courage of Admiral Souchon. The escape of his two ships from the enemy's force of twenty-five after a search and pursuit which lasted

ten days and covered several thousand miles, must take high rank in naval history.

The real importance, however, of this achievement was less naval than diplomatic, for the appearance of the two ships in the Bosphorus after their spectacular escape from the British Fleet served to hasten the downfall of Russia, and to throw Turkey into the arms of the German Powers, and thus prolong the war.

ALBERT GLEAVES.

METEOROLOGY: AN INTRODUCTORY TREATISE, by A. E. M. Geddes, O. B. E., M.A., D.Sc., New York (D. Van Nostrand Company), 1921. 8°, Pp. XX+390, Pl. 21, Figs. 103. Price, $6.00.

Many of the recent advances in the science of Meteorology have resulted from observations far above the surface of the earth in the higher regions of the atmosphere, but it is not alone by such observations that meteorology has progressed; sometimes, results obtained in the laboratory of the experimenter or in the study-chamber of the investigator have yielded more than the most distant and perilous ascents into the atmosphere, and it is likewise when the settled knowledge of the subject has been summed up to form a new starting point, as it has been in the present volume in a manner unexcelled in its suitability for the general reader, as well as to those concerned in the applications of meteorology in commerce and weather forecasting and in the arts and industries. For these, the whole range of the subject has been covered, unfolding each part from its historical background and devoting the greatest attention to modern methods, and instruments, and results. There are chapters on the composition of the atmosphere at different heights and the distribution of dust particles; on radiation; on temperature, including the temperature of the sea; on the theory of the winds, especially the general circulation of the atmosphere, the land and sea breezes, and mountain winds; on the water vapor of the atmosphere, embracing accounts of clouds accompanied by fine illustrations, and of fogs attended with the results of the most authentative investigations; on the minor circulations of the atmosphere including the cyclones of the temperate and tropical zones, tornadoes, waterspouts, and line squalls; on the free atmosphere, describing its divisions into troposphere and stratosphere and the correlation between pressure and temperature at different heights, and their relation to the "structure of the atmosphere"; on atmospheric electricity; on meteorological optics; on the acoustical properties of the atmosphere; and on weather forecasting and climate. Illustrative views and diagrams of high quality abound throughout the whole of this well arranged and clearly written book, and an excellent index is provided.

The author is Lecturer in Natural Philosophy in the University of Aberdeen, and thus has been in close association with the Aberdeen

Meteorological Observatory of the British Meteorological Service, which is under the supervision of the Professor of Natural Philosophy of the University. This circumstance explains the large extent to which the materials employed to illustrate principles have been drawn from British meteorological sources. Owing to his relations as a student and with a view of stimulating research, it might almost have been expected that the author would have addressed himself more fully to a clear exposition of the state of knowledge with reference to the unsolved problems of meteorology, like the general circulation of the atmosphere, the cause of the daily variation of pressure, the origin of the stratosphere and the phenomenon of finding the coldest air of the free atmosphere over the geographical equator.

G. L. LITTLEHALES.

THE PACIFIC TRIANGLE, Sidney Greenbie. The Century Company. Price $4.00.

The eternal triangle of love—the two striving in competition for the one—is the triangle of races in this interesting volume: races impelled by the impulse of interest, prejudice, and passion. The blushing object of these angular attentions, or, may we not say, the quarry of the international *chassez-la-femme*, is the islander of the mighty Pacific.

The author was adroit in his selection of a title, no doubt estimating, on the principle of *mal y pense,* that the frivolous would be caught by the suggestion of a fancied maze of amorous intrigue, while the serious would interpret the triangle as profoundly significant of the variance of the tremendous problem of our now most interesting theater.

Neither the serious nor the frivolous need be disappointed: the author writes of his own travels and was blind neither to the tropical "beauty unadorned" nor to the great philosophical and practical truths that he read as he ran in the cosmopolitan range of his Olympian vision.

The gentle reader, then, is served a substantial meal of international relations all adorned and sweetened and flavored to taste with delicious sprigs and sprays and side dishes of "salacious joys" and love—almost lecherous side dishes. And this is as it should be, for why should not our serious studies and worries be garlanded by the indigenous foliage of their *habitat?* And haven't we always been taught, by the literature of the Pacific, that we should unbend our Puritanical backs and limber up our so-called morals a bit when we approach the tricky 180th meridian? Long before we reach so far into the Pacific, the most prudish of us is well acquainted with the *hula* and *luau* and does not blink an eyelash at a shapely bronzed nudity. And this is as it should be, too—softness, simplicity, genuineness, generosity, back to Nature! It is the influence of the evanescent Polynesian.

And so Mr. Greenbie tells the story of the heliolithic Polynesian—of his centuries-long (or perhaps millenium-long) voyage, or voyages, to migrate from "over Kim's way," across the chains of islands that now

make Melanesia and Polynesia: a migratory wave so slow in rolling in that it picked up all sorts of flotsam of other nations and races and tribes.

"And the soft sweet flesh of young maidens began, generation after generation, to be covered with the tattooings of time, the records of the number of times the race had been reborn. So while the nakedness of youth was being clothed, mind after mind stored up unforgetable tales of exploit and of passion, till fancy sang with triumph over things transitory, and tawny men felt that never would they have to wander more." Thus the *Triangle* tells us about the Polynesian and whence he came, except that no mention is made of the late alleged discovery of the pre-Inca dash into the Pacific blood pot.

The author thinks the missionaries have overestimated "such minor conventions as wearing clothes and monogamy." As a matter of fact the mere matter of marriage has been both a remarkable leveller and a merciless differentiator of Pacific peoples to whom came, from widely separated regions, men whose notions of man's relations to women were widely divergent. And the clothes of the "devout disciple," yea even the heathenish *holoku,* or incondite "Mother-Hubbard," that the Christian missionary in Hawaii inconsiderately forced over the lithe limbs of gamboling nymphs (that their gambols might be less diverting in the sight of Christian males) was a deadening blight upon the native's physique as it was a vulgar blot upon Nature's artistry. They died of consumption.

In Australia, the rabbit was a pest; his enemy the ferrit was imported, increased and multiplied until he became a pest; then the cat was encouraged to increase and his hosts were turned loose upon the ferrit; the cat went wild. And now one of Australia's "serious problems" (the world is full of problems!) is the wild-cat pest.

Things increase in the warm Pacific—except the natives under Christian influence, who languish under competition with Americans, English, and Asiatics who absorb the Polynesian as the latter absorbed those whom they found innocently and happily cannibalizing life away when they came a-conquering ages ago.

We thoughtless or careless ones think of the tropics as full of breadfruit and an abundance of other foods ready to the native's hand without labor. While it is true that tropical fruits are rich in vitamines peculiarly suited for sustenance of so spirited a race, it is also true that there is not enough without labor, and the fear of famine "and the insecurity of life have dampened the joys of many a wild man, and the pressure of population has only too frequently resulted in infanticide and cannibalism." There are no indigenous animals anywhere in the Pacific islands. In New Zealand there are a few birds and a giant moa.

We learn that the Fijians are more remote in kinship to us than are the Samoans, Hawaiians, or even the Tongeans, for the Fijian is not Polynesian but Melanesian, a negroid sub-branch of Polynesians, while the Polynesian has his relationship to us though his Indian Aryan ancestry. The Fijians are patient and apathetic to life. Their *malua* is equivalent to the well-known Spanish *mañana.* The Fijian lets the Indian coolie do the

work. The Fijians are submerged by Hindus, Telugus, Madrasis, Sardars, and Hindustanis.

Suva is the eye of Fiji and of the needle of the Pacific, with nothing to sew under its stupefying sun. And yet the Fijis are among the most salubrious of South Sea islands. The traveler who hopes he sees progress in the ubiquity of corrugated iron roofing is reminded that the old thatch had to be renewed annually, the iron perhaps once in a generation; hence the iron age contributes in a decisive way to the degeneracy of idleness. The Fijians long have been recognized as excellent carpenters—a craft that passes down from generation to generation in families. Their shipbuilding always has been far superior to that of the neighboring Tongeans. *Kava* is the native drink of Fiji. Its manufacture used to be solely the chief's daughter's task who ground the *ava* root with her teeth and mixed it with water, but that method has been Volsteaded out. It now must be crushed in the *tonoa* (mortar) by a Hindu. *Kava* is drunk from the half of a cocoanut shell and is bitter but refreshing.

There is not much apparent joy in Fiji. The male is shy and is committed, body and soul, to the training of his bushy hair which is bleached with a mixture of burnt coral and water. The sexes seldom meet in social intercourse—no flirtations; neither kiss nor any compensating substitute.

Fijians shine in their music; its weird and vigorous composition is more fascinating than the passionate voluptuous tunes and dances of the Samoans and Hawaiians, more artistic than European music. Fijian choral voices are the loveliest in the world.

Samoa, too, has its music, its *lali*-players as in Fiji, the *lali* being the section of a tree trunk which once made the war-alarm or call to cannibal feasts, though now it invites the faithful to Christian prayer at the Davuilevu Mission. They also have the drink from the *ava* root.

Samoa is more occidental than Fiji. There is the *talofa,* or meeting kiss, and the *tofa,* or parting kiss—with cheek to cheek at an angle. Bread-fruit trees grow in bi-sexual pairs, the female bearing the fruit. *Vailima,* Stevenson's home, is now the residence of the governor-general at Apia. The natives remember the great man affectionately as *Tusitala,* the tale-teller.

As for other artists, there are Melba and Annette Kellerman, near by in Australia. Annette came to her swimming naturally for it is said that Sydneyites are the most amphibious folk in the world, but it is doubtful if this estimate includes the Hawaiians.

Australian cities have fifty-one per cent of the commonwealth's population, which means that the hinterland is somewhat neglected.

In Melbourne, Greenbie's eyes roamed again and found "Victorian belles, tall, graceful, russet-skinned, plump but not flabby, moved with a fine air of self-reliance. On closer acquaintance I found that these girls were not silent and opinionless as were most of the New Zealand girls." What's more the men allowed them to express their opinions: good companionship between the sexes; not so in New Zealand. The

people were a joy to look at, says the author. Cockney is prevalent in unguarded moments.

"White Australia" is the keynote of all Australian policies and Labor is at the bottom of that. The country's greatest difficulty is insufficient population, with only four and half millions in about the same area that holds 110 million Americans. She has a vast region not likely to be touched by labor for generations. "Australia uses the same argument against outsiders coming in as does America in regions already well developed." Australian "Labor" opposes not only Japanese but any cheap labor immigration. Legislation excludes from "immigration into the commonwealth . . . . any person who fails to pass the dictation test; that is to say, who, when an officer dictates to him not less than fifty words in any prescribed language in the presence of the officer" fails to pass in the judgment of the immigration officer who may spring any language on the candidate—Spanish on a Jap, for example. "The law has kept Australia white but with pallor rather than purity."

The failure of conscription was due to the "white" policy. The question in politics was a great strain upon domestic tranquility. The pro-conscriptionists argued that they must assure the Allied victory so that Prussia or her future ally might not swoop down on Australia. The opponents argued, "Let us keep our men at home to protect us against the possible peril." The latter pictured an invasion as soon as Australians might be sent to Europe, and pointed to Europe's importation of coolie labor. One member of Parliament was heavily fined for stating his fears in terms of Japan.

"That mere excessive breeding gives a nation a right to invade other lands is a principle that no decent-minded man could tolerate for a moment."

As a memento of Australia's birth as a "convict colony," a tennis club at Subiaco, suburb of Perth, will not accept as a member anyone whose grandfather was born in Australia "lest that ignoble ancestor should have passed on some of the taint." But of course "convict colony" is now no more applicable to Australia than to Virginia, for the last convict was brought out in 1840.

Australia is exclusive in discrimination against English workmen and Asiatic and colored people, while New Zealanders are anathema.

In New Zealand, an Australian cannot get a job. Our author traces the reason for the psychological homogeneity in the British antipodes, and explains why the New Zealander is the exact *replica* of the Englishman, while the Australian, especially of the east coast, is as little of an Englishman as possible. In times gone by, it has been the case of New Zealand and Australia that clung to the mother country instead of the reverse.

The natural beauty of New Zealand rivals that of any other country of its size except Japan. Its three principal cities are quite different in character though of about the same size, boasting some 80,000 inhabitants

each. New Zealand youngsters have free railway passes for journeys to school.

It might be said that the people have distinguished themselves in their treatment of the Maoris for no race on earth has been given greater opportunity to make good, but the *tui*, the bell bird, whose song is sweeter than that "blithe spirit" immortalized by Shelley's ode, sings of the Australoid's failure in the race for which he was not equipped constitutionally. The savage who was educated and became a Shakespearean scholar is the exception.

But if "Labor" has kept the antipodes conservative in progress, that is not so in reference to Hong Kong, whose population, in an area of twenty-nine square miles, is one tenth of that of Australia's millions of square miles. And the English found Hong Kong a barren island when it was demanded from China seventy-five years ago.

Speaking of the ease with which one white policeman in Hong Kong can control a large throng of Chinese, the *Triangle* says: "Thus China enjoys a oneness like that of water. Easily separated, lightly invaded, rapidly united, her masses flow on together when directed into any channel, and it matters little where or why. . . . Yet, what nation or race in the world has maintained such indivisibility against so much separation!"

Perhaps Chinamen are living too much in mind of old Laotsze, their noble philosopher of the seventh century B.C., whose real name was *Li* (which stands for *plum tree*). He is said to have been born old with a white beard. They called him Aged-Boy as he went about wildly preaching philosophy diametrically opposed to Confucianism.

All these observations, and many more, represent two sides of the Triangle while the third side is found in our own Japanese relations. Mr. Greenbie's estimate is that Japan has no basis for her appeal that her people be given free entry the world over because Japan herself does not:

(1) permit the free entry of alien labor; or
(2) permit the ready purchase by aliens of agricultural land; or
(3) make the naturalization of aliens easy; or
(4) permit the denaturalization of her people abroad.

The author draws an interesting comparison in citing the great fear that Japanese residents of the Hawaiian Islands have of the Kilauea fire-pit where heathen Hawaiians enthroned *Pele*, the goddess of fire, and recalling that the beautiful Princess Kapiolani, enlightened by American missionaries, approached the brink of the awful pit and bravely defied her ancestral deity. Hence the Hawaiians are more nearly removed from the slough of superstition than are the Japanese.

We are told, however, that affairs appeared to be moving so swiftly in the land of the last great autocracy that the author confidently expected to see a revolution, or at least universal manhood suffrage, during the previous year, 1920.

Truly the ways of the Orient are intricate for even the expert student: our author admits his own bewilderment and his own failure to discover

the great issue in the mass of pleading—the solution of the political functions of the triangle—the discovery of the kind of *Palladium* that should be erected for China.

As to the Anglo-Japanese Treaty, it is said that Japanese public opinion was about equally divided between those that feared the treaty would be abrogated and those that feared it would be renewed.

Then appears John W. Lamont, the efficient protagonist for the Consortium, when Japan is opposing that co-parnership in finance, unless she can hang upon it a certain recognition of her "special interests" or alleged diplomatic squatter's rights in Mongolia and Manchuria. Lamont proved to be an adroit diplomat for it seems that it suddenly dawned upon Japan that the joke might be on her if she withheld her own participation in the Corsortium which she came to suspect might harbor tremendous possibilities for her own aggrandizement through industrial developments that might work such wonders as, for example, make quite available that choice Shansi coal field, said to be much superior to the finest of Pennsylvania anthracites both with respect to quantity and accessibility. (Shansi has enough to meet the world's demands for about a millenium.) One thing more, Japan has been assured that she "need have no reason to apprehend that the Consortium would direct any activities affecting the security of the economic life and national defenses of Japan." Lamont found Japan much more nearly isolated socially than geographically.

The Consortium is made possible by the acquiescence of the American, British, French, and Japanese banking groups. It only awaits the establishment of peace between North and South China to begin business under the partnership.

Now, we are to learn just what the Consortium, so long shrouded in mystery, really is. Unionized finance—closed shop in banking. It eliminates competition which is an advantage accruing to the bankers, probably at the expense of the buyer of credit, China.

The great obvious virtues of the Consortium are: (1) it binds the great powers together in mutual interests which presumably should have some tendency to keep such powers from warring; (2) it makes such powers mutually interested in, and responsible for, Chinese progress, just as the members of a holding corporation are interested in the solvency of their subsidiary corporations; (3) its activities, it is agreed, will be confined to administrative finance, that is to say, it will not undertake such private enterprises as banking, manufacturing or commerce, but will devote itself entirely to construction of railroads, of which China has only 6,500 miles and needs 100,000 miles, to laying highways, and to reorganization of the currency. It will make loans only to federal and provincial governments.

This interesting book closes with the well-known plea for better international understanding as the panacea for war. But does not that do violence to historical precedent, for is not war invariably the result of intimacy? And when have nations quite strange, one to the other, gone

to war? It has been the neighborly "warring and learning tribes" of Europe that have brought the world its most amazing culture and civilization.

G. C. Thorpe.

ABOUT THE PACIFIC

There are 70,000,000 people within the bosom of the Pacific and more than half a billion in the countries that touch its shores.

A Polynesian reached polar ice in the north seas about 450 A.D., going in his big canoe.

The Hawaiians are accused of having eaten Captain Cook and one old man used to exhibit himself to tourists as the human reliquary of Cook's left big toe.

The flat bookworms of the Fiji Islands eat great holes into (or *in*) Suva's library.

Fijian outrigger canoes with mat sails are known as *takias.*

Taboos, the Polynesian fan tells us, are merely the parents of atrophied occidental conventions.

Savii is the largest island of the Samoan group. Its Mua Peak emits a sluggish smoke.

Thursday Island is one of the smallest of the Prince of Wales group in the South Seas. It is north of Cape York Peninsula in Torres Straits.

Ratu Joni Mandraiwiwi, the most powerful living Fijian chief, lords it over 80,000 subjects.

The most southerly hotel in the world is at Bluff, New Zealand.

In Samoa the loin cloth is known as the *sulu;* in fact, that designation is correct in many groups of the South Sea Islands.

One drinks *kava*, *yagona* or *buza* in Fiji. Any one of them accelerates the reactions. Kava is bitter.

The *eta* in Japan is an outcast class. The *eta* is the specialist in dead things. He is not only the butcher but he hauls away the dead horse or carries off the dead cat. But the *eta* also sells the flowers for decorating the *tokonoma*, the most honorable place in the home. And yet the *eta's* touch profanes the lowest classes.

The kiss is unknown in Japan, nor have the Japanese any substitute therefor.

The *geta* is the Japanese sabot.

The Fijians have contributed little romance to the Pacific compared with the Samoans and Marquesans.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of life, regular, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become asociate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Asociate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

Naval Institute Prize, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles submitted be typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

C. C. GILL,

Lieut. Commander, U. S. Navy, Secretary and Treasurer.

TOPICS FOR ARTICLES

Suggested by Request of the Board of Control

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
Shore Duty for Enlisted Men.
The Limits of Specialization in Naval Training.
The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.
Armor or High Speed for Large Surface Vessels?
Airplanes and Submarines Versus Super-Dreadnoughts.
The Navy's Relation to the Nation in World Affairs

At a meeting of the Board of Control, held 9 August, 1922, a resolution was offered and passed, that, in order to assist the Naval Academy authorities in obtaining a suitable textbook for a new course, the Naval Institute announce

A Prize Contest

for

AN OUTLINE PLAN

of a

Textbook for midshipmen

on

"HANDLING PERSONNEL."

This contest is open to all competitors, whether members of the Naval Institute or not.

The competition will be judged by the Board of Control and the awards made accordingly.

The first prize will be $200.

A second prize of $150, a third prize of $100, and a fourth prize of $75 will also be awarded, provided that the papers submitted are of character that, in the opinion of the Board, justify these additional prizes.

All papers submitted in this contest must be submitted over the signature of the author and reach the office of the Naval Institute on or before 1 February, 1923.

In judging these awards the criterion will be the usefulness of each paper toward the compilation of the proposed textbook. The *outline plan* should indicate clearly for each chapter its subject matter, scope and manner of treatment. Additional matter in the way of explanatory notes and illustrative examples based on naval experience are wanted and will carry weight in the contest according to their usefulness in the compilation of this proposed textbook to be used in an intensive course for first class midshipmen. A strictly naval book based on successful naval experience is desired.

None of the papers will be published in the Proceedings but it is understood that the Naval Institute is authorized without further compensation to use material from any or all papers submitted in the production of the proposed book.

C. C. Gill, *Lieutenant Commander, U. S. N.,*
Secretary and Treasurer, U. S. Naval Institute,
Annapolis, Maryland.

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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. No. 48, No. 10 OCTOBER, 1922 Whole No. 236

THE AFFAIR OF THE BLANCHE
(October 7, 1862)

An Incident of the Civil War

By Rear Admiral Albert Gleaves, U. S. Navy

After the proclamation of the blockade by President Lincoln, the navy was charged with the duty of maintaining it, and for this purpose the fleet was divided between the Atlantic and the Gulf coasts.

In the first part of the war blockade running was generally done by small sailing vessels running between the Capes of Virginia and the Rio Grande but these were soon driven off the sea by the Federal cruisers, and their places were taken by steam vessels built for the purpose either in England or Scotland. They were light draft vessels of about 500 tons displacement, and considerable speed.

As a rule they were manned largely by Englishmen, and often were commanded by English naval officers who obtained leave of absence for the purpose, and who sailed under assumed names. The risk and adventure and the chance of easy fortune attracted many bold spirits into the service, and blockade running soon was reduced to a science. The compensation for officers and men was large; the captain's pay for one voyage was about $5,000, the pilot received $3,750, officers were paid from $750 to $2,500 and the crew's wages were $250; besides this all hands had ample op-

portunities for speculations of their own. Cotton that was worth 40 cents a pound in Texas sold for $10 in England. The runners loaded with munitions of war, medicines, clothing, etc., in England, and returned with cargoes of cotton valued at $150,000 to $200,000.* Each voyage was a get-rich-quick adventure.

After the coastwise traffic was broken up, the Bermudas and Bahamas became the points of arrival of the vessels from across the Atlantic, and thence to Wilmington, Charleston, Savannah, and St. Augustine on the Atlantic coast, and Havana and Matamoras in the Gulf.

The blockade runners not only kept the navy occupied, but they also gave the diplomats and international lawyers much to discuss, and there were several affairs which brought the United States to the verge of war with more than one European power. This article deals with one of the most celebrated cases which might have involved us in war both with England and Spain.

It is the story of the United States cruiser *Montgomery*, commanded by Commander Charles Hunter, U. S. Navy, and the destruction of the Confederate steamer *General Rusk,* afterwards renamed the *Blanche*. While in the Confederate service she had entered Havana under the Confederate flag, but at the English consulate she was given up to an English subject, who documented her at that consulate, after which she sailed under English colors. The *Blanche* was one of the boldest and most audacious of the runners. During her career she had run the blockade six times, and Admiral Farragut was anxious for her capture. She ran between Matamoras and Havana, and time and time again she had escaped capture by slipping in behind the reefs, which mark the western end of Cuba, and keeping within the neutral zone of Cuba. She was a two-masted iron side-wheeler of 500 tons, with a walking-beam engine, painted black, and drew about seven and a half feet of water.

Hunter was a well-known, dashing officer who had entered the navy in the early thirties, but owing to ill health, he had retired from the service several years before the war, and was living in Newport when the war broke out. His residence on Kay Street was only a door or so from that of Mrs. James Lawrence, the aged widow of the hero of the *Chesapeake*. Hunter was a favor-

**The Blockade and the Cruisers,* Soley, Scribner's.

ite of Mrs. Lawrence, and when the news came that Fort Sumter had been fired upon, Hunter rushed in to tell her that he was leaving immediately for Washington to ask to be put back on active duty. He said he had all his uniform except a sword, and the tradition is Mrs. Lawrence gave him a sword that had belonged to her gallant husband.

Hunter was commissioned a commander in the navy and assigned to the command of the *Montgomery*, a gunboat attached to the East Gulf blockading squadron which was commanded by Rear Admiral Farragut.

The Admiral had known Hunter for years, the families were intimate, and Hunter was one of Farragut's "boys." Farragut knew his determination, his courage, his willingness to go ahead and take chances. One day, so the story goes, in the cabin of the *Hartford*, the Admiral spoke to Hunter of the exploits of the *Blanche* and of how pleased he would be if she were captured, and he said something to the effect, "If you fall in with her, Charlie, you will know what to do."

Of course it is impossible to know what was actually said, or what was in Farragut's mind or even if the conversation actually occurred, but it has long been believed in Hunter's family the Admiral conveyed the impression that if Hunter captured the runner even without the law, and should thereby suffer the extreme penalty to satisfy an irate nation, the Admiral would turn his blind eye to informalities, and at all events would come to the rescue if aid was needed, after the war should be over.

Hunter was not the man to ask questions or to beg for details. The hint was sufficient. Doubtless he made up his mind that if he had the opportunity he would end the career of the *Blanche*, one way or another. The opportunity came and he seized it; at the port of Mariano about five miles west of Havana the burnt and twisted hull of the *Blanche* was soon lying on the beach. Thirty-six years later, Lieutenant John Hood, of the navy, in another war drove ashore and wrecked the armed Spanish liner *Alfonso XII* at Mariel a few miles further to the westward.

Before dawn on October 7, 1862, the *Montgomery*, several days out of New York, lay to, off the light on Morro Castle, Havana. When day broke she lowered a boat, and her captain went ashore to communicate with our Consul General Schufeldt.

It so happened that also lying-to waiting for daylight to go into port was the English mail steamer *Trent,* which exactly eleven months before, that is November 7, 1861, had been held up in the Bahama Channel by the U. S. S. *San Jacinto* and the Confederate Commissioners Mason and Slidell taken out and removed to the man-of-war.

Hunter had a long interview with Consul General Schufeldt,* himself formerly a naval officer (and soon to re-enter the navy and serve with great distinction), but what they discussed is not a part of this narrative. Hunter did not return to the *Montgomery* until about one o'clock, when the ship got under way and stood to the northward and westward.

About an hour later a steamer was sighted to the southward and westward, standing to the eastward close in shore. At this time the *Montgomery* was about five miles from land.

The next chapter of the story is briefly told in the ship's log.

October 7, 12—4 P. M.

At 2 saw a steamer inshore of us; fired a blank cartridge from the rifled gun, but she would not stop. At 2.20 a shell being jammed in the rifled gun fired it toward the rebel steamer. The shell struck 600 yards from ourselves only. She then showed English colors, and stopped her engine heading for shore.

At 2.30 thinking her ashore sent in two boats armed, in charge of Acting Master Arthur to examine her. At 3 the boats boarded her, and it was almost immediately perceived she was on fire. Got men into the boats again, and in ten minutes she was in a solid sheet of flame.

Two men from the steamer got into one of the boats, and were brought to this vessel.

The steamer was the *General Rusk* from Indianola for Havana, with cotton cargo. At the time of the boats boarding her she was aground. At 3.45 the boats returned; took them up, and kept away down along the coast, steering a safe distance from land. At 4 Moro East, distant eight miles.

In the subsequent investigations by both the Spanish and American naval courts, the facts as stated in the log book of the *Montgomery* were practically substantiated. These facts were amplified by the various witnesses, but other allegations derogatory to the Americans were entirely disproved; the most serious of these was the accusation that Master Arthur and his men had set the steamer on fire.

* Commodore R. W. Schufeldt, U. S. N.

It is now convenient to turn to the *Blanche*. She was commanded by a native of New Orleans named R. H. Smith. According to his testimony before the Spanish court "in the ever faithful city of Havana," as the record runs, the *Blanche* sailed from La Vaca, Texas, on September 29, for Havana, with a cargo of 569 bales of cotton valued at $142,000. On October 4, she had stopped at the port of Mulato at the west end of Cuba for twenty-four hours to coal and pick up a pilot. When the *Montgomery* fired the blank shot she put into Mariano, and sent a boat ashore with the pilot to request protection of the Spanish authorities. The Sea Alcalde and his son responded to the call, and Captain Smith delivered the *Blanche* to the Alcalde, who hoisted the Spanish colors over the English.

At this time the boats from the *Montgomery* were seen pulling toward the *Blanche*, the *Montgomery* being at the time about one mile from shore. The captain, observing that the men in the boats were armed with pistols and cutlasses, slipped the cable and beached his ship.

When Master Arthur boarded the *Blanche* he demanded the ship's papers, and was given only a provisional register, a crew list, a table of crew's wages, and a certificate of ownership; there was no clearance, no bills of lading, no manifest. As a matter of fact it was proved afterwards that the ship's books and papers had been destroyed by the captain's order in the fire room, just as the boarding party got alongside.

Arthur told the captain that he would have to take the ship out, and sent an engineer whom he had brought with him into the engine room, which was on the main deck, to see if the engines were all right; almost simultaneously with the report that they were, fire broke out below, and in a few minutes the ship was blazing from stern to stem.

The *Blanche* had offered no resistance, nor had any personal violence been committed by the *Montgomery's* men.

When the fire drove the people out of the ship, they all got ashore except the pilot, and an English passenger named Clement, both of whom escaped in the *Montgomery's* boats. The pilot was transferred that night to a passing Spanish schooner bound for Havana, and Clement was given passage to Pensacola whither the *Montgomery* was bound and where he arrived on October 11.

Hunter was apparently well pleased with his action, as was also the Admiral. Under date of October 14 he writes to his wife:

We leave in the morning to blockade off Mobile. I wrote you a few lines from Havana a week ago today. I went on shore in my boat and remained three hours, bought some fruit and a few segars. Saw the Consul and left before noon. Got on board in an hour and was steering west along the coast of Cuba. About 2 saw a steamer south of us going east. We then only eight miles from Havana, headed towards the steamer, fired a gun at her without shot. She did not stop but was going rapidly towards Havana very near the shore. Fired a shell towards her. She stopped, showed English colors and anchored. Sent two armed boats to her. She hoisted Spanish colors over the English when she saw our boats coming and ran her on shore. Our boats boarded her, and the engineer I had sent was backing the engines when it was perceived she was on fire and crew escaping. Our boats returned on board. I remained long enough to see her half consumed and left. She was the notorious *General Rusk* with English papers and was called by them the *Blanche.* She had run the blockade five times. They were very foolish to set her on fire for if I had forcibly taken her off, the English would have made the Spanish government pay for her, and if I had met her at sea and sent her in to our ports, the court would not have condemned her.

I was congratulated by the Admiral for my good fortune in catching the rascal. I hope I may be the means of destroying half a dozen more which are in Havana to sail to any place they can get in. I am to cruise twenty and thirty miles from Mobile at my request or suggestion to the Admiral, as the steamers expect to be about that distance off just at night and run in before morning.

We arrived last Friday. I went to the Admiral's ship. He asked me to dine, met Palmer, Captain Hitchcock and Alden, pleasant dinner.

There are six or seven rebel steamers at Havana bound for any of the blockaded ports in the Gulf that they can get in. They will all have English papers—but that will not deter me from seizing them if I meet them at sea. There is a rascally Englishman at Havana, that swears that he owns the steamer or rebel sailing vessel, and then gets a register for her from the English consul.

When our boats were leaving the burning steamer two men jumped into them. One was a Spanish pilot that the steamer had taken on board at the west end of Cuba—the other an Englishman that was going to Havana from Texas. I let the Spaniard go that night putting him on board a small vessel going to Havana. The other I brought along and have taken his deposition about where the steamer was bound, where from, and that he believed that she was fired by her own crew. And now he goes to New Orleans to get to England where he was bound. He lost all his clothes.

A few days later Hunter captured the *Caroline* loaded with French muskets, munitions, cigars, stationery, etc. When captured she was from Havana, and endeavoring to get into Mobile. In a letter dated October 28, describing the chase and capture of the *Caroline*, Hunter says:

There are two men of the *Caroline's* crew that were in the *General Rusk* when she was burnt. The Captain (of the *Blanche*) and all hands swore most positively that we set fire to her, and the Spanish government made a great fuss and sent out three Frigates to catch us. I hope I may be ordered home on that affair. I want to catch another rascal and then I shall think I have done my share, particularly if he is as important a one as the *Caroline*. I saw this same vessel when I was in Havana, she was coaling directly under the consul's windows, there are four or five other rascals there waiting to come out. I am afraid they will hear that we are waiting for them and not come this way. The men and officers are all so glad and I am happy for them and myself that the *Montgomery* has done something. I would not give her up for any vessel out here, unless we were going into a fight with the rebels at Fort Morgan and in Mobile Bay, then I would prefer a vessel with more guns.

Hunter speaks of the rum on board of the *Caroline* which he had had locked up, but which, when at Pensacola he sees one of the men "groggy," he determines to destroy:

Of this he says:

I had no legal right to do so but felt I had moral right. I stood by and saw the heads of thirty-two five-gallon demi-johns knocked off and their contents poured into the ocean.

This cruising outside is much more endurable than remaining at anchor blockading. I want to catch another rascal but our chance is diminished since the *Cuyler* is here too. I shall keep outside of her if I can and away from her.

I have written to William* to say to Mr. Seward that the two men sent home in the *Caroline* as a part of her crew were in the *Blanche* when she was burnt, and ought to be detained as criminals for that act, —which I see that the Captain and crew swore that we did—or the depositions of these men should be taken that the vessel was fired by the Captain or by his orders. If I am not ordered home on account of the *Blanche* a court of enquiry may be ordered out here to ascertain under oath all the facts of the case.

He speaks of a schooner from Philadelphia to which he sends a boat notwithstanding heavy weather "as I do not permit any vessel to pass without examining her papers."

*William Hunter in State Department.

December 10, Mobile Bar.

Commodore Bell ordered me to anchor about a mile to the west of his ship, to keep full steam always at night, to have the guns ready and men at them and ready to fire at an instant's notice, and to be ready to slip our cable immediately that any of the rebels appeared coming out; there are now nine or ten, yes I believe twelve vessels blockading—enough I should think to keep the *Oreto* in.

We ought to be allowed to go by Fort Morgan even if we cannot take it. I suppose *Ironclads* may be sent here, they can put their vessels near the fort and bang away in security and will get all the credit—while many of the vessels here have been months and months engaged in the most trying of all duties, blockading.

He speaks of a sloop they had taken, the *Wm. E. Chester,* loaded with cotton, nine bales of which had been thrown overboard to lighten her sufficiently to cross the bar. He had cruised about and picked up every bale.

I have written to the Admiral to know what I shall do with the nine bales of cotton that we picked up. We might have sold it at Pensacola for twenty-six hundred dollars but I was not sure I had a right to do so—and fearing that I might do wrong, and as it was a money transaction to operate for my benefit in part, I was more cautious not to assume responsibility; I would rather the whole and hundred times as much should be entirely lost than anyone say I did wrong to benefit myself pecuniarily—I rather would be broken for the *Blanche* affair than even suspected of wrong in any money transaction.

December 14, 1862, Off Mobile Bar.

We are still at anchor in the same position where I let it go a week since. I suppose that we are to remain here until we want coal again, which will be in five or six weeks. I saw a fortnight ago, symptoms of a little feeling on the part of the other vessels at the bar that the *Montgomery* was too lucky and that her being outside was considered by them to be a comment upon their want of vigilance here when we caught a vessel that had come out. I then thought that, as the Admiral is away, the next in command would, upon the plea that we were necessary at the bar, to chase the *Oreto* when she should come out, be detained here and so we are. We could do more good outside, but others think perhaps we are more useful here—but I cannot complain and shall say nothing unless another vessel is sent out to take our place outside, then I could ask the Admiral if our action there was not satisfactory to him and express my regrets that it was not.

It rained in torrents the day of the *Blanche* investigation, and Captain Hitchcock came on board and I got wet seeing him off, and it was very cold the next day. I still have hopes of being recalled on the *Blanche*

affair; if I had not sent boats to ascertain her character I would have been much blamed by navy officers and perhaps by the government—I could not help their burning the vessel. If we had got her off before she was set on fire I do not think I would have sent her in, and if I had, of course she would not have been condemned, but the Captain thought he would get better price for his cargo and vessel from our government by firing her than by going in. I hope he may be disappointed, our government ought not to pay a penny. If we had fired her of course we should have paid for her; the affair has caused so much discussion from the wicked perversion of facts by her Captain and crew swearing to such abominable falsehoods—I would send you the result of the investigation here but it is long and does not differ from what you already know.

The following letter shows how completely surprised he was at the action taken by the Department.

At Sea. January 10, 1863.

I write with a pencil as we are under way going fast and it shakes a good deal in the cabin right over the propeller. A week ago day before yesterday (Thursday) the *Circassion,* Captain Eaton, arrived. I went on board the *Susquehanna* in the P. M. about four where I saw Captain Eaton—he told me that he had a document for me on board his vessel marked important that he was ordered to deliver to me in person and take a receipt. He said he did not know its contents—I imagined it, and felt sure that I was ordered home and was very happy. I went on board the *Circassian* with Captain Eaton and he gave me the sealed document which on opening I found was the following (orders to turn *Montgomery* over to executive officer and return in her as passenger. Also orders to executive officer). This was killing—overwhelming after suffering so much and doing all in my power to aid the government in putting down the rebellion—to be disgraced and degraded is indeed hard. I have the sympathy of the navy—of those above me—I have no doubt, many enemies among the officers below me who want to get me out of their way. Fox is their friend and not mine. They thought I would resign rather than submit to the humiliation of being deprived of my command and ordered to come home under the executive officer—I gave up the command the next day. I shall not resign until I am tried, if I am to be tried, but after that I ought to do so, or at least do no more duty while the present unjust government is in power.

The officer in charge has been polite and has not assumed at all. I have retained the sole use of my cabin and servants. I am grieved and sorrowful at my own unjust treatment, and at the critical state of the country which appears to demand it to satisfy the clamors of Spain. We must be weak to give way to wickedly false statements as sent from Havana in regard to the *Blanche.* The government cannot punish me more than it has done even if it takes my commission from me.

As was to be expected Spain had at once made a vigorous protest. On October 20, Mr. Tassara, the Spanish minister at Washington, addressed a long letter to Mr. Seward on the part of his government and demanding "prompt and immediate satisfaction and reparation for all the wrong inflicted and all the interests damaged by the outrage, and the burning of the English vessel, the *Blanche,* on the beach of Mariano (Mariel)."

The Minister summed up the "offenses" under four heads:

1. Violation of the jurisdictional maritime belt of Cuba.

2. Insulting Spanish authority in the person of the Sea Alcalde, aggravated by the "capture" of the pilot and taking him out of the country.

3. Insult offered to the Spanish flag together with another neutral flag.

4. Burning of a neutral merchant vessel without respect to existing treaties.

On November 30, Captain Hunter's brother, who was in the State Department, wrote a letter congratulating him on the capture of the *Caroline* but had this to say about the *Blanche.*

> The Spanish are excessively indignant. Tassara their minister here has addressed three notes to us upon the subject, translations of two of which we have sent to the navy department to be forwarded to Admiral Farragut. . . . The object of the Spaniards of course is to show that there was a wilful violation of their territorial jurisdiction, and that the *Blanche* was set on fire by the boarding party from your vessel. They wish to fix the accountability upon our government. The *Blanche* though nominally owned by an Englishman named Wigg, is probably in reality the property of rebels, and in Texas and elsewhere on our coast is known only by the name of *General Rusk.* . . . The distance (from shore) is the most important point in the case, for you had no right to assert belligerent rights when nearer than three miles, as we say, but the Spaniards claim six miles, as the limit of their jurisdiction. This claim however will not probably be assented to by us. . . . It is to be hoped that you will get out of the scrape honorably to your professional discretion as well as spirit, but rebels and Spaniards are most vindictive adversaries.

The affair caused intense excitement in Madrid and bitter outbursts against the United States. However much the government might have wanted to save their face, the diplomatic conditions were such that an apology and disavowal were necessary. There was just a chance in Hunter's favor that might tend to

mitigate subsequent action. "Admiral Farragut," writes Mr. Walter Hunter, "seems to have supposed that the government ordered an investigation of the circumstances of the case of the *Blanche,* because it suspected he (Captain Hunter) had been remiss in failing to bring out the steamer as a prize. It does not seem to have occurred to him that there was any impropriety in his chasing and boarding a vessel within Cuban jurisdiction. Such being the case I find reason to hope that the court-martial will visit lightly an excess of zeal which involved a breach only of international obligations. The danger lies in the furious and persistent demands of Spain for 'the swift and condign punishment of the commander of the *Montgomery,*' and the anxiety of our government to avert her wrath and to toss some Jonah to the whale."

Under date of December 9, 1862, Lord Lyons, the British minister, in a letter to Mr. Seward presented on behalf of his government a claim for reparation of damages and injuries to British owners in the destruction of the *Blanche.*

To the Spanish minister Mr. Seward replied on October 23, in effect that the department had not received any information of the transaction mentioned, promised no delay in ascertaining the merits of the case, etc., and to Lord Lyons on December 10, he replied to the same effect.

It is worth noting that more than two months after the event, the Secretary of State had received "no reports or other information from its own agents of the material facts."

The Spanish Government presented claims for a total of $311,859.29½* and demanded the punishment of Commander Hunter. The English claims for damages were included in the Spanish claims.

It is interesting to read that as late as April 24, 1863, Mr. Seward wrote to Lord Lyons that the claim "would be given due consideration."

It was a much easier matter to settle the account with the naval officer. He was selected to be tossed to the whale!

Commander Hunter was brought to trial by a general court-martial which convened at the Boston navy yard in February, 1863. The president of the court was Rear Admiral S. L.

*Note the ½ cent!

Breese; and the members, Commodore Henry Eagle, J. L. Lardner, Captains Jas. Glyun, John Pope, T. T. Craven, and Chas. Green. The judge advocate was Harrey Jewell, Esq., of Boston.

Hunter was tried on two charges, the first violating the territorial jurisdiction of a neutral government. The first specification of the charge alleged that he took forcible possession of the *Blanche* within the territory of Spain, defied and insulted the Alcalde, and forcibly took away a Spanish and an English subject and held them as prisoners. The second specification alleged that he caused the *Blanche* to be set on fire.

The second charge was scandalous conduct tending to the destruction of good morals. There was only one specification under this charge, and it alleged that he extorted from the English subject a statement on oath that the *Blanche* had been set on fire by her own crew.

The Spanish naval court examined thirty-eight witnesses, and the Boston court thirty-seven witnesses. It was clearly proved that no personal violence had been offered the Spanish authorities —it was claimed that one of the *Montgomery's* men had slapped the face of the Alcalde's son—that the ship was set on fire by order of the captain of the *Blanche*, who had prepared for such an emergency before he left Indianola, to prevent her falling into Federal hands, and that the statement of the English subject that Hunter had forced him to sign under oath the ship had been fired by her own crew was false. It was further proved that in beaching his ship, the captain of the *Blanche* had been guilty of barratry.

Captain Hunter spoke at some length in his able defense, and he made clear an important point, which evidently however did not carry weight with the court. He said that admitting for the sake of argument that he had violated not only Spanish jurisdiction but *neutral* Spanish jurisdiction, that unless coupled with an allegation of disobedience of orders, unofficer-like conduct or the like, a violation of neutrality or jurisdiction is not an offense, within the meaning of the Articles of War or the Statutes of the United States to justify punishment. The Articles of War are silent on this head.

This argument is sound. A few years ago an officer was tried by general court-martial for grounding his ship, and under the charge of neglect of duty, the specification was alleged that he did not come on deck when a certain light was sighted, but this allegation was not coupled with any offense—as there is nothing in the regulations which requires a captain to come on deck when a light is sighted. The result was that the court acquitted the officer.

Hunter was found guilty of the first charge, and first specification; the second specification was not proved. He was honorably acquitted of the second charge. The court sentenced him to be dismissed from the navy.

Hunter's case was a *cause celebre,* and it was generally thought in the navy that he had been treated with undue severity.

Admiral Farragut wrote to him on June 17, 1863:

I was much pained that the government should have deemed it necessary to order you home for the investigation of the case of the *Blanche* as it deprived me of your services, which I much needed, but it should not have given you a moment's disquietude, as you knew that your *Admiral* and *Brother Officers* all considered that you had done your duty, and with that zeal that all good officers will do it; and leave it with the Judiciary to unravel the entanglements of the laws of nations, which it is not to be supposed an officer is at all times to be the proper judge.

When afloat I shall always be most happy to have you under my command; and although I do not expect again to have that honor I hope we may often meet on shore to talk over the pleasures and excitements of the past.

And again on August 24, 1863:

I received your kind letter, and regret that mine was so long in reaching you. I have not been able to get the particulars of your trial but am astonished to learn from you that you were dismissed by a court; I can understand that the government might find it convenient to sacrifice you to preserve our relations with Spain, at a moment when we could not afford to involve ourselves with an additional enemy, but I had no idea that you had been condemned by a court of naval officers. The government must have found some different testimony from that which I saw but I still hope all will come right; when I visit Washington I will find out all about it. I fear it will not be in my power to visit Newport, if I visit any of the watering places it will be Sharon to get the rheumatism out of my shoulders.

Hoping that we may yet serve together, and be co-workers to balance that *old account* (and not in a Privateer).

Captain Thornton A. Jenkins* wrote:

U. S. S. Oneida, July 5, 1863. (Pensacola)

I am sorry, truly sorry that you have been ordered home on account of that rebel vessel *Blanche* burnt by the Captain and her crew.

I have an abiding faith that Mr. Welles and his associates will do you full justice when they are made acquainted with the true state of the case. It is mortifying to an officer who is ever ready to sacrifice all comforts of life to endure every hardship of our misunderstood profession with faithful performance of duties some of them too of the most delicate and complicated character to be censured. Still I am greatly mistaken in Mr. Welles if he does not see that you have full justice done to you in the end.

Let what may come and what may be done, there are those here who will never cease or fail to remember and speak of the energy, zeal and intelligence displayed by you on this station and especially on this blockade. Keep your spirits. All may be lost save honor. So long as we have our honor and full assurance of having done our whole duty let the world frown as it may, we may despise it.

Two years afterwards he received the following interesting letter from Senator Anthony:

Washington, January 21, 1865.

One day, last week, I sat next Vice-Admiral Farragut at dinner. I am sure you will be pleased to know that he spoke of you in high terms, as a most valuable and efficient officer; and he thought you had suffered very unfairly. Seward was present, and said "if you will ask for him, when you next take a command, I think he will be put back." Farragut said he certainly would do so, and added that he would like to be on the court-martial when an officer was tried for such an offense as was alleged against you.

As this was said at a private party I would not like to have it made public, but I have no objection to your reminding Farragut of it, if it would be of any service to you.

It was a matter of great gratification to Captain Hunter that nearly nine years after the affair of the *Blanche* one of the most distinguished officers of the navy should have shown his good will by sending him the following letter:

1409—K St., Washington, June 1, 1871.

I am solicited to be in Newport on the seventh of July next to attend a meeting or re-union of the "Army and Navy of the Gulf" of which society Admiral Farragut was the late president.

I hope you will join and become one of us. We are to meet in the Academy of Music and a banquet will follow. My family will accompany

*Afterward Rear Admiral.

me on their way to Portsmouth, N. H., where they propose staying during the hot months. As you were one of the most earnest and self-sacrificing naval officers of the war, I desire you to join us. General Phil. Sheridan is first vice-president and I am second, and a president is to be elected.

With kindest regards to your family,
I remain truly your friend,
THEODORUS BAILEY.
R A.

The affair of the *Blanche* followed the *Trent* affair by eleven months and preceded the cutting out of the *Florida* in Bahia by exactly one year to the day. In all three cases the action of the naval officer was approved by the country, but disavowed by the government as an independent act of officers. In the words of the Secretary of State in the *Florida* affair, which applied to the other two, "it was an unauthorized, unlawful and indefensible exercise of the naval force of the United States."

For his part in the *Trent* affair, Captain Wilkes was at first commended and afterwards censured. Commander Collins of the *Florida* was never brought to trial; his punishment was an order to take the *Florida* will all prisoners back to Bahia and deliver the vessel to the Brazilian Government. However while lying in the stream at Hampton Roads, she was rammed by an army transport, but not badly injured. Later she sank at her moorings off Newport News, and the incident was closed.

Commander Hunter was dismissed from the Navy, but in 1867 he was restored, and placed on the retired list as captain.

Whatever satisfaction the Government may have enjoyed secretly in the unlawful acts of Wilkes, Collins and Hunter, it was for obvious reasons necessary to publicly disavow them. Nevertheless these officers rendered distinguished service to their country by so doing, and although they sacrificed themselves each won honorable fame.

Commodore Duncan Ingraham in the *St. Louis* would have violated the neutrality of Turkey by sinking the Austrian corvette *Hussar* in the harbor of Smyrna, if the Austrian captain had not complied with the demand to give up Martin Kosta, and for his determined action Congress voted him thanks and a sword. The commander of the British light cruiser did violate the neutrality

of Chili in 1915 when he sank the *Dresden* in Juan Fernandez. Many similar examples could be cited if space permitted.

If history teaches anything it is this: when in doubt it is better to go ahead, act boldly and take the chances. Blind obedience to orders, "playing to the program" as the politicians say, never got a man anywhere; on the contrary, it has ruined many a career.

The conclusion of the whole matter may be summed up in a paraphrase of the words of a recent writer, "Do what you think is right, even when it is wrong."

But every officer faced with opportunity must decide the question for himself. There is no rule.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE INFLUENCE OF MATERIAL ON NAVAL OPERATIONS

By Hector C. Bywater

Not so very long ago the editor of a certain British naval periodical invited me to contribute an article dealing with some phase of the Battle of Jutland. On my suggesting that a comparison of the material—ships, armor, guns, projectiles, etc.—at the disposal of the British and German Fleets might be interesting and instructive, he showed some hesitation, and finally remarked that he would prefer me to write of the human element and the influence that discipline, training, and tradition had exercised on the course and result of the Jutland action, adding that in his opinion the material factor was of negligible importance, especially in this particular battle, where the opposing fleets were evenly matched as far as the quality of their weapons was concerned. This disinclination to examine problems of naval tactics from the hard, matter-of-fact viewpoint of the so-called materialist and the tendency to concentrate instead on the more romantic aspects of naval history, such as individual gallantry, the facing of heavy odds, and heroic efforts, not always successful, to compensate for deficiencies of material by sheer courage and will to win, is very marked among naval students; and anyone who attempts to assign to material its proper value in modern naval operations is liable to find himself crying in the wilderness. And yet it is impossible to dip into the records of sea warfare, especially during the past seventy years, without realizing the prosaic fact, unpalatable though it be to historians of the sentimental school, that the outcome of a naval engagement is always largely governed, and sometimes mainly decided, by the qualities or defects of the material employed.

It need hardly be said that a superiority in material produces the most decisive results when there is virtual equality on the human side, and such equality must necessarily be assumed in any academic discussion on the relative value of naval weapons. Numerous examples could be quoted in which one fleet, superior in numbers and equipment but manned by crews of faulty morale, discipline, and training, and led by a commander of weak and vacillating character, has been utterly routed by another fleet inferior in numbers and armament but handled and fought with skill and resolution. So far as the World War is concerned, it may be said without fear of contradiction that for the first two years or so there was little to choose between the British and German Fleets in respect of the courage, discipline, training, and devotion of officers and men. This was, moreover, the period that witnessed all the most important naval operations, and it is therefore the period that offers the most promising field for a study of the influence of material on modern sea tactics. That the subject is much too vast to be dealt with adequately in a few pages of print goes without saying, and in the limited space at disposal it will be impossible to do more than touch upon the salient data derived from the World War which are pertinent to the issue.

No comparison of the British and German Fleets as they stood in August, 1914, is of much value unless it takes into account various considerations which governed the respective shipbuilding policies of the two powers. While it would be futile to pretend that the British Fleet during the years immediately preceding the war had not been developed largely with an eye to its eventual employment against Germany, it is nevertheless a fact that the North Sea, although recognized as the most likely battleground of the future, was by no means the only sphere with which British naval strategists were preoccupied. Thus, if battleships, cruisers, etc., were designed primarily for fighting in North Sea waters, it was still held to be essential that they should be able, if necessary, to operate just as effectively in any other quarter of the navigable globe. In other words, the British ships of 1914 were, in the well-known phrase, built to "go anywhere and do anything." This involved the pre-emption of a not inconsiderable proportion of the total weight and space in each ship for purposes

which did not conduce directly to fighting efficiency. It was necessary, for instance, to provide the officers and men with better living quarters than would have been required had the ships been meant only to make short cruises in the vicinity of their coasts. It was necessary, also, that they should have a large fuel capacity, and, further, that their efficiency for battle should remain unaffected even when they carried their maximum supply of fuel and stores.

These requirements, coupled with the demand for higher speeds and heavier armament than were found in contemporary foreign ships, imposed a most difficult task on British naval constructors, and one that was more complicated than that which German designers had to solve. For the German Fleet was created for the express purpose of fighting Great Britain, and all its capital ships were designed for work in the North Sea or the Baltic, the contingency of their having to operate at points many thousands of miles distant from the Fatherland being thought so remote as not to justify special provision. In the case of these ships, therefore, a lower standard of habitability could be accepted, and although the fuel capacity of German dreadnaughts was nominally as large as that of British vessels of equivalent displacement, it was actually very much less, because many of the coal-bunkers were so placed as to be almost inaccessible and probably were rarely, if ever, used for their ostensible purpose, being regarded rather as part of the protective system of the ship. This particular point has been overlooked in previous comparisons of British and German material, but it will be appreciated by those who inspected the German ships surrendered after the Armistice. On the other hand, it is only fair to acknowledge the great technical skill of German constructors and the ingenuity which they displayed in utilizing every fraction of displacement and every cubic foot of space for increasing the fighting efficiency of the ship.

German capital ships were, indeed, not cruising ships but fighting ships *par excellence*. Moreover, they were designed on tactical principles which differed in some important respects from those favored by the British Admiralty. Grand-Admiral von Tirpitz, the creator of the Imperial German Navy, had his own ideas about warship design, and it must be admitted that

many of them were vindicated by war experience. In his judgment, the first requirement of a vessel built for the line of battle was that it should keep afloat and retain its power to fight even after receiving very heavy punishment. It was useless, he argued, to endow a ship with tremendous offensive power while at the same time leaving her so vulnerable that she might be knocked out by a lucky hit before she had a chance of bringing her weight to bear. When the first British battle cruisers of the *Invincible* class came into service, Tirpitz called them "Fisher's ten-minute ships," meaning that ten minutes was the limit of time they could hope to remain in the battle line in view of their very light protection. The fate of the *Invincible* and the *Indefatigable* at Jutland seemed to corroborate this estimate, while, on the other hand, the survival of most of the German battle cruisers after a terrific hammering from large-caliber guns testified to the soundness of the Tirpitz theory that protection was a feature of design which could not be subordinated to armament or speed without incurring the risk of summary destruction.

Again, the loss of the *Queen Mary, Invincible* and *Indefatigable* furnishes a conclusive answer to those who maintain that the personal element can always rise superior to deficiencies of material. Animated by dauntless courage, thoroughly efficient in every branch of their work, the thousands of splendid officers and men in these three ships were, nevertheless, the victims of a fatal defect in material which they could under no circumstances have overcome. Why the three ships should have been destroyed so easily is a mystery which has never been solved, and probably never will be unless their designs are made available for inspection. It seems, however, that those who inspired the designs had miscalculated the effect of fire from medium caliber guns, for it is notorious that each of the three vessels succumbed to a few salvos of twelve-inch and eleven-inch shell. In these early British battle cruisers an attempt was made to give them a speed that would enable them to choose their own range, and guns of sufficient power to outshoot the enemy, the idea being that the latter should be brought under fire and knocked out before he, with his lighter and shorter-ranging weapons, could reply with any effect. But the Germans, with great prevision, had forestalled this plan by giving their ships a degree of protection

that enabled them to resist this initial punishment, thus compelling the heavier-armed but more vulnerable British ships to come nearer, in order to make their fire more decisive, and incidentally bring themselves within range of the lighter but very effective German artillery.

There seems no doubt that Lord Fisher and the tactical school he represented had exaggerated the effect on *well-armored ships* of a few hits from heavy shell. On the strength of paper formulae it had been calculated that a few rounds from 13.5-inch or 15-inch shell would put any ship out of commission. This, however, was so far from being the case that after the Battle of Jutland twenty-five hits from 15-inch shell and as many more from projectiles of lesser caliber were counted on the *Derflinger* alone; yet the ship was still afloat, her machinery was intact, and she was still able to use part of her armament. What is the explanation of this striking discrepancy between, on the one hand, the theoretical and the actual results of British gunfire at Jutland, and, on the other, the powers of resistance exhibited by battle cruisers of the respective fleets? The answer is easy. British principles of design and armament were based for the most part on theory, while the German principles were founded upon actual experience derived from tests. During the years that the British naval authorities were building up their dreadnaught fleet they made very few experiments to determine debatable points relating to design, and never, to the best of the writer's belief, undertook such gunnery tests as might, and probably would, have given them betimes the experience that was purchased so dearly during the war. Germany, on the contrary, prefaced each new stage of development by exhaustive experiments made regardless of cost. The gunnery and torpedo trials alone which they carried out between 1908 and 1914 must have run into a figure exceeding the cost of an additional dreadnaught, yet this lavish expenditure on practical demonstration was undoubtedly the soundest form of economy in the long run. On one occasion they built a target representing the midship side and underwater section of a modern battleship; it weighed several thousand tons, and was used principally for trying out alternative methods of localizing sub-surface explosion. By this drastic method they were able to perfect underwater protection

to such a degree that not a single German capital ship of the dreadnaught type was lost by torpedo or mine, though casualties of this nature were far more common in the German Fleet than in the British. Gunnery tests were conducted on the same realistic and extensive scale. In the years before the war the High Sea Fleet regularly fired at whole squadrons of obsolete ships, some of which had been partly reconstructed for the purpose and fitted with modern armor-plate over part of their hulls. Experiments of this kind not only gave invaluable practice in gun pointing, fire control, and fire discipline, which subsequently bore good fruit in the war, but rendered it possible to test the various types of projectiles and thus enabled the Germans to produce the remarkably efficient armor-piercing shell that made their gunnery so effective at Jutland.

So convinced was von Tirpitz of the value of stout armor protection and extensive subdivision, that rather than sacrifice this feature he was content to give his battle cruisers a lower speed than that of their British "opposite numbers" and to arm both them and his battleships with guns of smaller caliber than were mounted in the British Fleet. He claimed that the adoption of this lighter armament involved no real sacrifice of fighting power, because the Krupp guns were superior in accuracy and all other ballistic properties, and could drive their projectiles through the comparatively thin armor of British ships at maximum battle range. By accepting smaller guns he saved a great deal of weight that was mostly utilized for improving protection, though some allowance had to be made for the greater weight of the German cartridges, which had to be packed in brass cases owing to the construction of the Krupp breech-block. It may be pointed out, in passing, that the ideal of unsinkability which German constructors strove to attain had long prevailed in their navy, for as far back as 1896, Herr Dietrich, on the designing staff of the German Admiralty, stated in a paper read before one of the learned societies that German warships of that day differed from the British in that they were divided up into as many watertight compartments as was deemed possible without interfering with the working of the vessel. "Perhaps," he added, "we have already gone too far in this, and service on board may be obstructed. Every athwartship bulkhead is solid and un-

pierced. Communication from one engine room to another or from one stokehold to another must be established only over the protective deck above water, or may be carried on below by telegraphs and speaking tubes."

Some interesting particulars of the development of German armor-piercing shells were given in a book, *Die Technik im Weltkriege,* published in Berlin after the war. In this volume Naval Constructor Betzhold offers the following observations on British ammunition at the Battle of Jutland, though his patent desire to make propaganda for German industry has probably led him into some exaggeration. "The British projectiles in part did not burst at all, and in part detonated outside the armor; while the German fuse did not produce an explosion until the shell had passed through the armor. The composition and stowage of the British powder charges and their inadequate protection formed an ever-present source of danger to the whole ship. Both in disposition and thickness the British armor proved unequal to the attack of the medium caliber German guns; on the other hand, the strength and quality of the German armor was such as to defeat attack by the heaviest British calibers. The 15-inch shell was unable to penetrate our 13.7-inch armor even at ranges from six and one-quarter to nine and one-half miles." Another writer in the same volume, Commander Kinzel, states, with reference to the superior functioning of the German projectiles, that the Ordnance Department of the Marine Amt had long recognized the importance of improving A. P. shell and had devoted endless thought and experiment to the subject. "Thus, the German shell used at Jutland was the result of years of collaboration between the naval authorities and the firm of Krupp. It was made of Krupp crucible nickel-chrome steel, which was unsurpassed in hardness and toughness. It tapered at the nose to a long and fine point, which was protected by a cap made of softer material. The discovery of the most favorable form and the most suitable material for this cap was only made after numerous experiments, which cost a great deal of money. To obtain the maximum effect from a burst it was necessary to employ a highly-explosive aromatic composition; but since substances of this nature usually detonate upon impact against armor, the difficult problem had to be solved of so 'phlegmatizing' the charge that it could be brought

safely through the thickest armor, though without in any way impairing the violence of its disruption. The severity of this problem may be judged by the fact that at the date of Jutland the British had not succeeded in solving it. In spite of prolonged experiments, they had been compelled to load their armor-piercing shell almost exclusively with black powder* which, although less sensitive, was far less efficient than the high explosive compounds. Equal care was displayed in perfecting the fuse, which is, of course, the all-important element of an A. P. projectile. Thanks to an unwearying devotion to duty, which rose superior to the many disappointments met with, we succeeded eventually in devising a delay-action fuse which was unaffected by any shock, and which allowed the intact projectile to penetrate well into the vitals of a hostile ship and then caused it to explode. In this wise, therefore, was put into the hands of the German Fleet an armor-piercing shell as perfect as human foresight could make it—a weapon superior to anything that our foemen possessed."

Here we have a typical example of that patient, scientific striving for perfection which made German naval equipment so efficient and formidable on the day of battle. Thanks to their superior range-finders and fire-control apparatus—which had been developed on the same principle of thoroughness and attention to detail—the German gunners were usually able to get on to the target almost at once, and once they had found it they knew that every shell that went home could be depended on to produce the maximum effect. This, unfortunately, could not be said of the British projectiles in use at the date of Jutland. As Lord Jellicoe afterwards wrote: "The battle convinced us that our armor-piercing shell was inferior in its penetrative power to that used by the Germans, and immediately after the action I represented this with a view to immediate investigation. With one of the old type of armor-piercing shells of a particular caliber as used at Jutland the shell would, with oblique impact at battle range, break up whilst holing a certain thickness of plate, and the shell could not, therefore, reach the vitals of the enemy's ships. A shell of the new type and same caliber, as produced by the 1917 committee, would at the same oblique impact and

* This statement is inaccurate.—H. C. B.

range pass whole through a plate of double the thickness before exploding, and could, therefore, with delay-action fuse, penetrate to the magazines of a capital ship. Had our ships possessed the new type of A. P. shell at Jutland, many of the enemy's vessels, instead of being only damaged, would probably not have been able to reach port." How, in face of this admission, is it possible to maintain that the material factor is of negligible importance in naval combat? As a consequence of the neglect to produce a thoroughly efficient projectile, much of the fine work done by British gunners at Jutland was lost endeavor. Eighteen months later (November, 1917) there occurred an incident that further emphasized the lesson. A British squadron, which included the battle cruiser *Repulse,* surprised German mine-sweepers at work in the Bight under cover of a light cruiser screen. A brief action ensued at high speed, during which the *Repulse* scored a raking hit from her 15-inch battery on the German light cruiser *Königsberg.* The projectile, weighing over 1,900 pounds, passed through all the funnels and exploded in one of the forward bunkers. It broke up into a few large fragments, the detonation being so feeble that only minor local damage was done. Had this shell functioned efficiently it would probably have destroyed the ship.

As with gunnery equipment, so with torpedoes and mines: the German weapons were of uniformly high quality and rarely failed to do what they were expected to do. The torpedoes generally ran true, thanks to meticulous care in manufacture and adjustment, and the effect of their explosion was always disastrous because the war-head was exceptionally large—the desirability of increasing the charge having been demonstrated by peace-time experiments. The German type of mine, too, retained its supremacy to the end of the war. This high standard of material was not due to any inherent superiority of German science or engineering. Invention is not, and never has been, the German forte. But where the race excels is in its capacity for improving on the ideas of others, for taking up an idea at the point where it has been dropped by the originator and patiently improving it to the utmost limit. This faculty has led to remarkable results in many spheres of activity other than that of naval

technique, e. g., the development of aniline dyes, synthetic drugs, and optical glass.

In the writer's opinion, experience has proved beyond dispute that good material is as essential as good personnel to the attainment of decisive results in modern naval warfare, that the two elements are interdependent, and that serious shortcomings in the one cannot be balanced by superiority in the other. Naval men who insist on the vital importance of aiming at super-quality in ships, armament, and equipment may be dubbed "materialists" by the unthinking, but the epithet is really a term of honor. There was a time, it is true, when false doctrines of materialism prevailed in the higher councils of the British Navy; when it was believed that the key to victory lay in huge displacements and monster ordnance; and when so much attention was devoted to the piling up of tons and guns that perfection in detail was neglected, with the result that the advantage conferred by superior weight and numbers was largely nullified. But the lesson has been taken to heart, and today the British Navy is second to none in its zeal for one hundred per cent efficiency in material, no less than in personnel.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

GUN DEFENSE AGAINST TORPEDO PLANES

By Lieutenant Commander R. K. Turner, U. S. Navy, and
Lieutenant T. D. Ruddock, U. S. Navy

Guns and the methods of controlling their fire have been developed for use against objects moving in but two dimensions; for this reason we now find it difficult to use them effectively against airplanes, which move in three. In the course of development we may expect the effectiveness of anti-aircraft guns to increase very considerably, but only after we have designed them and their mounts, and have adapted methods for their control, for their special use in this activity. Until that time, however, we must make the best use of the weapons at hand, and if we can simplify the problem by eliminating the third, which is the most troublesome dimension, we shall doubtless find our problem's solution much easier.

A study of a part of the problem will show the principal gun defense of a fleet against attacks by torpedo planes may be handled in this manner. Indeed, it is probable that this defense will be very similar to that now provided against other torpedo attacks and that, in fact, heavy ships will have less to fear from torpedo attacks by planes than by other torpedo carriers, chiefly because the planes will always have considerable difficulty in launching torpedoes successfully at night. The possibility of using the ordinary secondary defense batteries against torpedo planes has occurred to many people; the object of this paper is to present in more or less complete form the general plan for so using these batteries. It is when the plane gets down near the water, as it must to make a successful torpedo drop, that it loses its power of using the vertical dimension for its own protection, and thus takes on the character of surface craft. Few special appliances

will be necessary for the battery operation, and these, and the special ammunition, can be provided in a very short time if necessary.

Since the torpedo plane is a new instrument of sea warfare, and one with which we have had very little experience, it is somewhat difficult to arrive at any very definite conclusions as to its tactics in delivering an attack. Generally, however, it can be safely assumed that it will approach at high altitude until near its point of attack, then drop as rapidly as possible to the surface of the water, head for its target and, as soon as steady, drop the torpedo.

Due to the fact that torpedo planes must necessarily be large, their speed will in all probability be low and their angle of descent small; it also can be safely assumed that the speed at which a torpedo can be launched from a plane is limited to a very slow plane speed. With these assumptions in mind we may proceed to the consideration of the problem in hand, that of placing such a plane under fire from the maximum number of guns at the earliest moment and assuring a reasonable chance of successful fire against it.

The plane will of course be attacked by the anti-aircraft guns as soon as sighted, but the probability is small of inflicting any damage with these at any except short ranges. The range at which the plane drops near the water will be inside the maximum range of the torpedo carried by the plane. During the descent of the plane it will come under the fire of the secondary battery when its angle of position is equal to the maximum angle of elevation of the secondary battery guns, minus the angle of elevation for the range of the plane. From this point on the plane may be kept under a continuous fire from the secondary battery, using shrapnel or high explosive shell.

The time during which the plane is in a zone dangerous to itself is dependent on the range at which it descends and also where it launches its torpedo. It may be assumed that under present circumstances a plane will probably not drop its torpedo at a distance greater than 2,000 yards. The straight run from the point of descent to 2,000 yards may be taken as the space during which the attack may be repulsed. The time to make this run is dependent on the plane speed, and if we assume that the minimum speed is in the neighborhood of sixty miles per hour, and the

maximum about one hundred miles, we may use then a mean speed of eighty miles for the purpose of a time analysis. If the plane comes under fire at a range of 4,000 yards, then at eighty miles per hour the time to reach 2,000 yards is fifty-one seconds. This time being so short seems to show that the general scheme of firing should be a barrage through which the plane must move in its approach and one which obviates the necessity of spotting. Hence, the control must be as nearly automatic as possible, and require few operations of sight and fuse setting.

Before proceeding further a few definitions of the terms used in the following discussion will be given so as to avoid misunderstanding.

1. A ladder is an automatic movement (without spotting) of the point of burst or impact of successive salvos.

2. A down ladder is one in which the points of burst or impact of successive salvos are moved toward the gun.

3. An up ladder is the reverse of (2).

4. A barrage is a series of salvos the shots of which are somewhat dispersed in elevation and azimuth and so placed that they should intercept the target.

5. A moving barrage is one which has the points of burst or impact of shell moved according to some prearranged plan (as, for instance, a ladder).

There are three alternative methods of placing a barrage across the path of an approaching airplane which will be taken up in sequence and treated in their various relations to probability of hitting and ease of manipulation. These are: 1. A stationary barrage short of the initial position of the plane; 2. A moving barrage with the first shot beyond the initial position; and 3. A moving barrage with the first shot short of the initial position.

The first method gives small chances of hitting the approaching plane because the short time involved precludes the possibility of enveloping the plane with the bursts of more than one or two salvos during the approach, and it is possible that the zone of fire may be avoided by the plane. With the second method the barrage is started beyond the plane and moved toward the ship at a rate faster than the rate of approach of the plane, and it is thus practically sure of catching it at least once if the difference in rates is sufficiently great, and with this moving barrage there

is a chance of having the plane within the danger space of the barrage for perhaps four or five salvos. With the third method the barrage is started short and is moved toward the ship at a rate which is less than the speed of the approaching plane. These last two methods will give excellent results provided the rate of movement of the barrage is not greatly different from that of the plane and it is started reasonably close to the target.

In discussing the rates of approach of the barrage in cases 2 and 3, a plane speed and a firing interval must be assumed. There is a maximum speed of plane at which a torpedo can be dropped and still have the torpedo in effective running condition. There is also a minimum speed at which the plane can sustain itself in the air. A combination of these factors seems to point to a plane speed for dropping the torpedo of about sixty miles per hour. To show the relative rates of approach of airplanes at different speeds during the salvo interval, the following table is given computed on the basis that the rates of approach of ship and plane, a resultant of their speeds projected on the line of bearing, remain constant. This may be called the "apparent" speed of the plane.

Salvo Interval Seconds	Plane travel yards per salvo at speed indicated				
	90	80	70	60	50
10	440	390	340	290	240
8	350	310	270	230	200
6	260	230	210	180	150

Upon an inspection of the above table the idea is presented that the size of the ladder in a moving barrage is closely connected with the speed of the plane, and that for slow speeds a small ladder is required, while for high speeds a larger ladder is necessary.

To a certain extent this is true in the case of the No. 3 barrage, in which the initial salvo is made to fall short of the target, because otherwise it might be possible for the plane to escape by not running into the barrage at all. For instance, suppose we conclude that, under average circumstances, we will be able to keep the plane under fire for one minute, since it will probably take that long to dive, straighten out, and drop the torpedo. Then

if we use a salvo interval of 10 seconds and a down ladder of 200 yards per salvo, a plane moving at an apparent speed of ninety miles per hour will run into the barrage at the rate of 240 yards per salvo, while a plane moving at an apparent speed of sixty miles will approach the barrage at only 90 yards per salvo. In one minute we may fire but seven salvos, which would allow the faster plane to run 1,440 yards and the slower plane but 540 yards towards the barrage. While it is possible to bring the fast plane into the midst of one or two salvos, it might easily happen that the slow plane would escape altogether unless a smaller ladder were chosen. Furthermore, if a salvo interval of less than 10 seconds is used, a smaller ladder is necessary; for an 8-second interval a ladder of 150 yards, and for a 6-second salvo a ladder of 100 yards would meet the needs of the situation. With No. 3 barrage in use, therefore, we may conclude that an estimate must be made of the plane speed if the best results are to be attained.

Suppose we now consider the case of No. 2 barrage, viz., that starting beyond the target and moving in at a faster rate than the plane. It would be necessary to have the barrage start just beyond the plane and move toward the ship at a rate only slightly in excess of that of the plane or else to start it far out and move it toward the ship at a rate which will arrive at short range in about one minute. The latter method would seem to be the better of the two, as it is independent of the plane speed and can be made automatic. Suppose the barrage is started with a fuse setting of 5,000 yards and moved at such a rate as to reach about 1,000 yards in one minute (this corresponds to a plane speed of 136 miles), and is then held at this range. With a salvo interval of 6 seconds this would mean a down ladder per salvo of 400 yards. Now as the bursts will vary as much as 100 yards short of and beyond the mean point of burst, and the danger space covers at least 25 yards beyond the farthest burst, the space covered per salvo is about 225 yards, which means that in sweeping from 5,000 yards to 1,000 yards fifty-six per cent of the space covered in the approach will be thoroughly swept by the bursts of the shrapnel or shell, and if the plane is making less than 136 miles apparent speed the barrage is sure to catch it and probably hold it for more than one salvo. If we are unable to fire every six

seconds, but fire every seven and one half seconds, we will fire nine salvos during the approach, or one salvo every 500 yards.

However, we may consider that, for the present, we are safe in covering plane speeds of from 60 to 110 miles per hour, and we will endeavor to sweep the sea from a range of 5,000 yards down to 1,000 yards. A 110-mile plane travels 4,000 yards in 75 seconds; therefore, if we fire every 8 seconds, we will fire 10 salvos during this time, including the first. This will require a 450-yard ladder, and the average salvo dispersion should cause fifty per cent of the approach to be covered effectively. A 60-mile plane could start 1,900 yards ahead of the barrage and be caught before arrival at the 1,000 yard range, and the average plane of eighty miles speed could start 1,200 yards ahead of the barrage and be caught. The 80-mile plane travels 310 yards per salvo, the barrage approaching at the rate of 140 yards per salvo; one salvo is therefore sure to envelop the plane, and there is a sixty per cent chance that a second will also.

A short barrage moved similarly to the over barrage (No. 2) can be employed but it is not believed it would be as effective as the over barrage because it can more easily be avoided and if it is started too soon there will be considerable difficulty in telling whether or not the first salvo has been fired at too short a range. No. 2 barrage seems to afford the best chance of hitting with the minimum number of fuse settings and the least amount of ammunition necessary at the guns. For instance, if we use a stationary barrage, to be moved by spotting, several rows of projectiles with the fuses set to various ranges must be available at the gun, while with the over barrage each row of projectiles represents a full barrage against a plane and the same number of projectiles represents a more effective defense.

The maximum range that would ever be employed as the starting point for anti-torpedo plane barrage has been suggested above as 5,000 yards. Steps should be taken to determine this range and make it standard. Of course, the barrage need not be started at the maximum range but in cases where the range of the plane is known to be shorter it could be started with normal salvo No. 2, 3, 4, etc. Upon arrival at the 2,000, 1,500, or 1,000 yard range, whichever is determined upon as the most suitable, the barrage, if in front of the plane, should then be maintained stationary,

and kept going until the attack has been concluded. It may also be desirable, after the spotter observes the fall of the first salvo, to shift to another string of projectiles, starting at a different number without interruption of the fire. For instance, if the first salvo falls short, (in a No. 2 barrage), and the spotter observes this after the third salvo, he may order the guns to shift strings, and, instead of the next salvo being No. 4 of the first string, it might be No. 2 of a second string; the latter series would then be fired to conclusion.

Either of the two following procedures of fire control can be used as seems best:

(a) Have the sights set on all guns at the maximum range that will ever be used in laying an anti-torpedo plane barrage and do not change them during the approach of the plane. Point each gun in elevation individually but use the director circuit for firing so as to be sure of the salvo-interval. All guns that are loaded should fire every salvo.

Train all guns using the broadside director system. Set no deflection except an initial estimate but cause the director trainer to train to the right or left of the target plane to introduce the deflections as desired. This requires no spotting other than a change in the trainer's point of aim and assures all guns firing at the proper target. Convergence correctors at all gun training receivers should be set at infinity to give lateral dispersion.

(b) Point all guns for both elevation and azimuth by the director system.

Train the director operators so that they can fire at definite time intervals.

Set the director sight for range for each salvo in accordance with a prearranged table furnished the sight setter.

Use an initial deflection setting and spot for deflection but don't hold salvos for the spots.

Set convergence correctors at guns to infinity to give lateral dispersion.

The only new material required to put a scheme of this character into operation is a quantity of five-inch shrapnel or high explosive projectiles (the latter preferably) fitted with time fuses, and also efficient fuse-setters. Both of these can easily be obtained on comparatively short notice. For a moving barrage the fuses should be set in advance and the shell placed in racks near the guns. In order to avoid deterioration of the fuse time train from moisure the protective caps should be replaced after the fuses are set and made airtight with a coating of shellac.

It has been stated that a heavy water barrage at from 2,000 to 3,000 yards range will prevent planes from launching torpedoes, but this remains to be proved. While water affects greatly the planes' flying qualities, it does not prevent flying altogether, and since the splashes from five-inch projectiles are small, and ordinary common shell don't always explode on water impact, a method more sure of actually doing damage must be adopted.

The system of organizing the batteries of the ships of a division to act as a unit, as has been suggested elsewhere in the case of the anti-aircraft batteries, seems feasible here as well. Each ship should use a slightly different ladder, but all should fire with the shortest possible salvo interval. In this way a heavier concentration can be obtained and a greater range of plane speeds be covered. For instance, with four ships in a division, each firing an average salvo of five guns every eight seconds, and starting the initial salvo at a point 5,000 yards, 45° on the bow of the leader, the space to a point 1,000 yards on the leader's bow may be very effectively covered by the following assignment of ladders:

Ship A—400 yard ladder.
Ship B—500 yard ladder.
Ship C—300 yard ladder.
Ship D—250 yard ladder.

With these ladders 49 salvos will be distributed close together from 5,000 to 1,000 yards from the leader and 15 more salvos at 1,000 yards range, all within a space of two minutes. The total shots fired will be 320.

The chief points to be emphasized in the fire control system for defense against torpedo planes are:

(a) The system must provide for a very large volume of fire in a short time.

(b) The control must be automatic so as not to interrupt the fire.

(c) The present material should be used so far as possible.

The exact details, as regards size of ladders, position of initial salvo, concentration by two or more ships, etc., may easily be worked out by co-operative exercises between a division of battleships and a group of planes. Such exercises should form a part of a training period in the near future.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SCIENCE AND THE NAVY

By Lieutenant Commander Fitzhugh Green, U. S. Navy

Our new navy has suffered one great loss: science as an avocation.

The naval officer is a fair executive, something of a marine engineer, and can deal superficially in both kinds of ballistics. The best of him stands high.

So did the best of Mr. Gladstone. He was a statesman of exceeding greatness. Yet on the occasion of his visit to Charles Darwin he regaled the father of the missing link with Bulgarian politics! Another time he called on Faraday, of whom it is said: "The English electrician; his work lives wherever a dynamo spins; who is in the airplane, the deep sea cable, the lights that light the ways of the world, wherever electricity serves our kind!" Gladstone listened courteously while the spark-guardian explained. Then grimly he asked, "But what good is it all?" Whereat the unabashed Faraday descended to the parliamentarian's level and replied: "Why, sir, presently you will be able to tax it!"

When the young Darwin cruised in the *Beagle* he brought back a fund of knowledge which the world still draws upon. The young naval officer will cover the same track under infinitely better conditions and bring back a Patagonian blow-gun he bought in Valparaiso and a rejuvenated acquaintance with the Bowditch.

The point is we are letting the specialists get away from us. No officer need be capable of designing an 18-inch gun or a high-pressure step-down transformer. But at least he should keep enough brushed up on tensile strength and voltage not to take any shoddy on deliveries. No officer need wear an alphabet after his name and know the etiology of a sun-spot. But it certainly

should be a matter of professional pride for him to keep in touch with the amazing strides of modern meteorology.

We send our picked postgraduates to the best technical schools in the country. Ask one what his first impressions were. "How infinitely little I knew about anything!" he'll exclaim.

Yet he knows a little bit about a great many things. Witness the list on his Annapolis diploma. The trouble has been the same that mortified Gladstone: he has no vision of science and history as a whole; is ignorant of the elementary ideas of biology and geophysics; of political, social, and economic science, of modern thought and literature.

It isn't necessary to be a walking cyclopedia to possess breadth. More is it a combination of an inquiring spirit with the habit of observation.

A set of instructions to cover the deficit would be difficult to draw up. Imagine a graduation address running so: "Young gentlemen, you have finished your course. You know enough to be ensigns in the navy. On the other hand your general ignorance is appalling. You will sail the seas with but a smattering of oceanography. Though by compass you will conn the ship, yet of terrestrial physics you are innocent. Landmarks shall loom, submergence lines baffle, while geology is alien to your rut-hung curiosity. Fishes in the sea, kelp upon the shore, air and the sun that warms it, guiding stars by night, strange peoples that you meet, very timbers underfoot, how shall you bring them home to the people who cannot wander? *Words*—words and less—in the glib sterility of your conversation. Young gentlemen, you are barely on the threshold of the world of knowledge. Make science your hobby and the universe shall open like a steamed clam!"

There would be applause. Applause at that moment is an unwritten law. But there'd also be some stifled jeers.

No, you can't go to a boy and say: "Boy, here is a book on entomology. It's all about bugs. You'll like it. It has nine hundred pages and twenty colored engravings. Entomology is a profoundly interesting subject." He might be polite; R. H. I. P.

But if you took him out in the woods and got him full of chiggers and he didn't believe there crouched a tiny bug beneath

each crater on his itching back; and you dug one out and let him look through a microscope at the pink wriggler; and then told him there were well-known bugs which man has never seen, too small for even the most powerful microscope to disclose; and explained the meaning of osmosis, and how the size of these infinitesimal bugs was determined by their osmotic abilities, using filters of varying densities, whence they are called *filterables*—why, the first thing you know that boy would be stealing fleas from Fido so he could work out how far a man could jump were he relatively as strong.

The Smithsonian used to go on that principle. Thirty years ago naval officers made hobbies out of natural sciences. Some of the best collections in both the National and American Museums hold many contributions from seafaring men. The British Museum makes no secret of its dependence upon military travellers for invaluable trophies and relics.

Pick up any scientific journal. World-wide scientific information is exploited above all else. What are the sources: paid savants and foreign federal employees. The former are too limited in number, the latter too limited in scientific perspective. Yet reports from our consular service give meat in some form or other to nearly every scientific paper that appears. Should it not then be a source of embarrassment that we of the navy, most travelled of all federal employees, glean nothing for our country? And lest there be some quibbler who would produce an average intelligence report as evidence to the contrary, it may be added that no better examples of the untrained observer in social, political, or ethnic sciences can be found than in just such papers.

What, then, can we do? There is no room to cram more courses into the Naval Academy curriculum. The average officer has only a limited amount of time for study in the press of ship or shore routine. And this time he would mostly prefer applied to professional lines. It looks like a saturated market from every point of view.

From every point of view but one: habit of mind. Take Pelmanism. Millions of dollars are being spent in advertising it. Hundreds of converts are daily being made. Yet of what does

it consist other than a method for putting to work the wasted inertia of a man's intelligence?

Start a navy system. *Develop the mental characteristics that promote a scientific attitude.*

They are definite enough. All research starts with curiosity. Curiosity is like any other appetite. It is fierce desire to begin with. When fed regularly it retains its pristine vigor. When starved it languishes and its owner eventually dies—intellectually at least. Fundamentally it should be the source of most mental energy and effort. Its impulse is the germ of progress.

Second is the hunting instinct. This is more brutal than curiosity. It comes out in competition like sport. We find it in the spirit of target practices, in the pursuit of mechanical short-cuts, in the striving to surpass cleverer professional contemporaries.

Third is the inborn tendency to hoard. Few individuals fail to enjoy some sort of collection—books, oddities, stamps, photographs. Like a rivulet this instinct may easily be diverted into channels wherefrom good may grow, scientific profit to one's self, one's profession, one's country.

Finally comes the instinct of workmanship which is more limited in the average. But even it is seldom entirely lacking in men with naval training. And the merest shadow of it can give the willing investigator or observer a means for interpreting much that he encounters in his wanderings about the world.

Next, and more specific, is the scientific attitude itself. To the youth in whom the four instincts above have been purposefully bred, modern science takes on a new and broader semblance. It becomes at once a sublime quintessence of common sense.

The savage had his fatalism. Thunder and lightning were just noisy flashes in the heavens, their meaning or value as distant as the clouds from which they leaped. The ancient had his prejudice. Scarcely a century ago men burned witches in Salem. Some of us cross our fingers to this day.

But modern science knows neither fatalism nor prejudice. It believes absolutely in the uniformity of nature. It calmly views the most terrific cataclysms of nature with profound assurance that each part and movement is but some definite cog in the gigantic mechanism of the universe. This, then, should

invariably be the balanced attitude of those who would see science in its true light.

The tone of that attitude must also be developed. There is danger of getting sidetracked. Professional peril can arise from a too great and absorbing interest in any one line. Mahan's contemporaries tell us he became so wrapped up in his military writings that he sometimes lost sight of the daily task. We are glad that he did. But he is the exception whose diversion should have been the original intent. The average of us dare not tempt habit to any such extent any more than we would risk taking morphine every day for a week. No matter how normal and healthy we were we might find the hunger had grown upon us.

No, the navy man above all others must have great breadth in his science hobbies. This can be reached through his pride alone. Ask one if he knows the ten most important advances in science in the last twenty years. And when he shows his dense ignorance by naming only two, rest assured he will stand his next watch pondering the profundity of his lack of education.

The idea is not far-fetched. Try the list one recent authority gives. At the forefront come the Brownian movements. Some of us have encountered them in our thermo-dynamics. Next, the divisibility of the atom. The naval aeronaut should appreciate what that means to our future aviation. And there is radioactivity—more in the surgeon's line. Yet a lump the size of a hen-house would, if its energy could be realized, operate the *Tennessee* from New York to Brest and back again continuously for 2,000 years! The atomicity of an electric current may be common knowledge to our radio experts. It is a safe wager, though, that the average turret officer doesn't yet know that if his hoist current could be magnified infinitely it would look not unlike a river of shining marbles. In the same line is the recent proof of the electric origin of all matter. This hangs on the sixth discovery, the "nucleus atom." Nothing more startling has ever been announced than the fact that each apparently indivisible speck of matter is in truth a whole solar system with billions of tiny electrified planets dashing about within it. Seventh and eighth are the X-Rays and their application to investigation of crystal structure. And, finally, are the radiatory qualities between

different substances and the latest theory of "quantum relations."

Could there be a better method of taking down the vanity of a self-assured member of the most technical profession in the world than by proving that he is just about a mile behind the times?

Possibly it all sounds too theoretical. The vigorously practical naval officer naturally demands to know what good a scientific attitude can be put to. His life is too matter-of-fact to deal with such abstractions as human instincts which go into making a man acquisitive of scientific information.

There are two main lines of practical application. One has to do with the future of the navy; the other with its present. As to the future we may argue from the classical examples of history. About 5,000 years ago the Egyptians knew so little about building that only rough uncut stones were piled about their dead. Scarcely 100 years later a mammoth pyramid was erected. Giant blocks eighteen feet on a side were fitted together in an exquisite perfection of union that would defy our most skilful modern builder. In 500 B. C. the Greeks likewise achieved a rate of progress in aesthetic culture that has never since been exceeded. Results have yet to be equaled even in our modern vanity of civilization.

Sad but illuminating were the terminations of both. In neither case was permanence attained. With unerring cruelty Fate overthrew both Egyptian and Greek successes so thoroughly that but crumbling ruins remain today. There was a reason. Listen:

In the past hundred years has come about an industrial revolution that surpasses the combined advances of all the two thousand previous years. In the past thirty years the naval profession has leaped into a refinement of mechanical complexity which still is difficult to account for.

Will it stay? Shall we continue to fabricate a seagoing military mechanism so cheap, so efficient, and so nationally valuable that it will constitute an asset to the country in peace as well as in war?

The answer can be simply framed. Egypt and Greece were like a wrestler who has through pure chance fallen upon a new hold. For a while this hold on progress was used triumphantly. Then lethargy came. Men grew content; lived in the past. There

was no originality, no striving for new things, no vision. The *scientific attitude* was yet unborn.

That was the reason for the debacle.

Not so different a fate awaits the navy whose personnel choose to glory in its past. Seeds sown by the few inspired beginners of our modern fleets fell upon the fertile ground of scientific investigators then at the pinnacle of their strength in industrial application. Let us dare neglect the soil or the seeds for successive crops and we, like Pharaoh's tribe, shall wake up some day to find the mechanical majesty of our high-seas past but a vanished dream.

We shall discover that our civilian specialists have become so *ingrown* that no longer can we understand them; so *unprompted* that they are no longer practical—at least so far as the use of their arts in sea warfare is concerned; so *erudite* we must stand aghast at their incongruity.

The other and immediate application of the scientific attitude may itself be divided into two parts: one, the actual collection of scientific data and general information during travel; the other, appropriate prompting of civilian experts upon whom we must depend more and more as time goes on.

A few examples of recent notoriety will suffice. No problem is more pressing in the world today than the one of fuel. Fascinating then is speculation on distilling alcohol from cellulose ferment. Already this is a general practice. The novelty lies in the source of the cellulose. Several have turned up. The Nile Sudd deposit is 35,000 square miles in extent. If fermented it would produce 80,000,000,000 gallons of alcohol yearly for an indefinite period! There is undiscovered oil and coal in the arctic and in Central America. Who is keeping the government abreast of such precious information? Consular agents and military or industrial travellers mostly.

Who could best? *The trained naval observer.*

The thrifty Dane has started using seaweed for fodder. He boils it down, presses and dries it, and crystallizes out the undesirable salts. Result gives a sixty-six per cent digestible carbonic hydrate with thirteen per cent protein. No, we navy men are not farmers. But the taxes that support us and buy our ships are largely paid by agricultural districts. Is it not our

duty, selfish duty if you will, to nurse our popularity along by a contribution now and then? Kansas hasn't any seacoast. Kansas wouldn't fear the enemy fleet when war began. But let one navy man be responsible for any idea that gives Kansas a million tons of cheap cattle food and Kansas would be voting an adequate navy for the next twenty years!

There is a Mexican cactus called *sisal*. It has thick and pulpy leaves five feet long. Sisal will grow on pretty nearly anything but a concrete walk. Its fibre has just the elasticity and stiffness to make an excellent binder twine. Twenty tons of digested fibre can be turned out by a tractor desiccator in about two hours. See the commercial possibilities in it? Information like that is worth money to a live promoter. Yet money is not what interests us. The thing is that it's our business while floating round the world to pick bits here and there that will make for trade and commerce, for the merchant fleet still struggling in its after-birth.

Last year an energetic Englishman left his ship at a Chilean port and struck 'cross-country for a week. He discovered that the country possessed 32,000,000 acres of wooded land in her uninhabited wilds. Nearly all our newspaper, much of our book and writing paper, comes from wood pulp. These new Chilean timber lands could supply all the newspapers in the world for 500 years! Yet the biggest dailies are this minute gasping for breath in the form of wood pulp America can't or won't supply.

A consul searched the environs of Bahia and found nearly a hundred species of drug-bearing plants. Such an inexhaustible supply of raw material might well shatter certain branches of so delicate a business as that of therapeutic chemicals. What have our naval surgeons been doing who visited Bahia these years past?

When food prices were soaring an inquisitive individual travelled down the Chesapeake and found over sixty species of game fishes. Many had not yet been exploited, or were not supposed to be edible. We don't study icthyology at Annapolis; but somehow fishes ought to be included in the mariner's repertoire of information.

The other day one of our weather men contrived a formula for predicting how warm it will be on any set day in the future

—the distant future, mind you. It reads: T=Ma plus Ra cos t plus Rd cos t′. T is the temperature sought. Ma is the mean annual temperature for the place; Ra is the greatest annual change, and Rd the same for the day. T and t are regular expressions of the date and time by clock. Very interesting and valuable, indeed. But can't you feel a twinge of mild reproach that a navy man hasn't done something of the sort? What is a seaman's business if it isn't weather above all else?

Sometimes, in the navy, his business may be war. Yet the point still holds. Captain von Mueller of the German raider *Emden* was a great student of racial ethics. It is recorded that the science of peoples and their customs had been a hobby with him for many years. When war came he found innumerable opportunities to make use of his esoteric knowledge.

September found him in the Bay of Bengal. Commerce of Southern India was just then gradually emerging from its chaos. A bold stroke was necessary to impress the enemy with Germany's power. Von Mueller played the single card which at that moment could take all tricks. With the cold logic of science he struck for Madras. After dark he opened fire on two huge oil tanks near the shore. Flames leaped into the sky, lighting up the countryside with a fearful glare. Natives were terrified. Money lenders from all the East Coast towns packed up and took to the hills. Without them no business could go on. Thus did von Mueller's pre-war hobby achieve a tragic derangement of India's business for a length of time that was counted by the British a real disaster.

All these examples lead us back to the original theme: the true test of an education is not whether it enables a man to make a living, but whether it equips him to interpret correctly the life around him.

When Morse invented his telegraph he nearly starved to death. Congress hesitated six years before it would appropriate $30,000 to test his device. In all that august body there was wanting a majority to envision what successful swift communication would mean to a distance-hampered world. Action was delayed by one Congressman who proposed an amendment that half the money be given for an investigation of mesmerism. And finally the vote passed by only 89 to 83.

We in the navy are in exactly the same position as Congress. We have it in our power to appropriate not money but information to thousands of waiting inventors, industries, and utilities. What we gather in the distant markets of the world may seem silly and insignificant to us. To the right person at home it may mean everything.

Then there is the other form of profit: the satisfaction of travelling with one's eyes open, of seeing the meaning in what goes on about. And finally, there is that deepest professional duty: to live and to learn without cessation of effort or degree through all the years at sea and ashore, so that when the crucial moment comes there can be no failing *because we didn't know.*

Ex scientio tridens!

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE DOLLAR AT SEA

By Commander Paul P. Blackburn, U. S. Navy

"Efficiency with economy" is the slogan of the day in governmental activities as well as in those of the commercial world. Economy without efficiency is parsimony; efficiency without economy is extravagance. The organization which is to function properly can be neither parsimonious nor extravagant; it must be economical or it fails. The navy has a definite constant mission and it has also a definite annual appropriation. "Money makes the mariner go," to alter the familiar adage; unless the navy gets full value in results for every dollar expended, those inclined to be critical might transpose this to read "the mariner makes the money go."

A fundamental difference exists between the point of view of the business man and that of the naval officer. The business man considers his every action as it affects his business with reference to the result of that action on the power of the business to produce more dollars or a greater result per dollar. The naval officer in his activities at sea considers the result in efficiency to be attained as paramount without giving constant consideration to the expenditure of money necessary to obtain the result.

During war the element of time is too important to give great consideration to the element of cost and the expense involved in any activity is subordinated to speedy accomplishment of the mission. While the World War was in progress money was plentifully supplied for all naval activities and the tendency to lose sight of the cost became almost a fixed habit of mind.

Today, the demand of the country for a decrease in the expenses of government is reflected by reduced Congressional appropriations for maintenance and operation of the navy. In consequence it becomes imperative that the navy get greater efficiency

for each dollar expended. To do this, the officers of the navy must adopt the business man's point of view and constantly keep in sight the dollar in their official actions. The manufacturer desires efficiency in his plant, the professional man in his relations with his clients, the tradesman in his store or ship, the artisan in his trade, the farmer in his farm, every branch of civil life strives for efficiency with economy. Commercial efficiency is measured in results per dollar; railroads compute cost per mile, factory managers are rated by their ability to decrease unit costs and the farmer lives by producing wheat at a low cost per bushel. Increased production coupled with decreased unit cost cannot be obtained without intensive study of the relation of the dollar to the finished product. If the navy at sea hopes to be more efficient with diminished funds, there should be an investigation into the cost of every activity with a view to reducing the cost or increasing the output, or both. Every officer on a ship bears a part of the responsibility for proper utilization of the ship and for proper return from the money spent in keeping the ship in commission and operating. Commanders-in-chief who formulate policies and issue orders requiring the expenditure of dollars have a greater responsibility in connection with economical administration than do their subordinates, yet the entire personnel of the fleet has its share in the cost of operation. More attention to the cost of everything the navy does, by every officer from admiral to newly graduated ensign, should so conserve the funds allotted to the navy by Congress that activities and training can be measurably increased.

For the fiscal year 1921, the individual costs of maintenance and operation of the first line battleships varied from $1,977,323.93 to $4,811,144.35 with a normal figure per battleship of about $2,500,000. This last amount was distributed approximately as follows: accrued pay $1,100,000; miscellaneous expense, including commuted rations $31,000; stores issued including provisions and medical stores $700,000; equipage $300,000; repairs and alterations to ships including equipage $369,000.

The item of pay is very nearly a fixed sum because the rate of pay is set by Congress and the number of officers and men on the ship is fixed by the Bureau of Navigation; the only control exercised over this by officers afloat is in the ratings held

by the men on board. Too many times the only basis for advancement of a man to a higher rating is his length of service in the lower rating; in civil life, the man's pay is a measure of his value to the organization. Officers contemplating the advancement of a man to a higher rating should ask themselves: "How much more money will this man get in the new rating? How much is he worth to the ship? Will the navy get full return for the additional pay this man will get?" Neither sentiment nor a desire to help out a well-behaved incompetent, but a cold matter-of-fact dollar basis should control.

Each officer should consult his own conscience and ask himself: "How can I make a greater return in service for what the United States pays me?" The navy pays an officer for what he does and he is obligated to prove his value in results. Examining boards must also put the dollar question to themselves and determine if the candidate for promotion will earn the pay of his new rank. Should any method of reduction of personnel by elimination ever come to pass, the officers and men who are worth the most will be the ones that the navy will keep. Those who pay poor dividends cannot be kept on the active list any more than a commercial firm can retain an employee who fails to aid production or sales.

"Miscellaneous expense, including commuted rations," is a very small part of the total expense, yet the summation of these figures for the whole navy for the fiscal year 1921, amounted to $6,793,161.21. Some of the items covered by this charge are mileage, canal tolls, postage, telegrams, pilotage; it seems probable that a part of this sum could have been saved had the individuals charged with the expenditure been as careful of the government's dollars as they are of their own.

"Stores issued, including provisions and medical stores" is the item of expense next in point of magnitude to the item of pay. It is also the item in which the greatest possibility for saving seems to exist. The "dollar-minded" officer, and all must become "dollar-minded," sees with a vision that covers the whole navy. He realizes the need for getting the greatest value for each dollar his ship spends, whether it is for paint, provisions, fuel, ammunition or anything else the ship uses. He must also realize the necessities of all the navy as one unit; dollars saved on the

Tuscarora may be made available for the needs of the *Swatara*. If the *Tuscarora* spends these dollars the *Swatara* does not get some much-needed improvement. No head of department aboard ship should hesitate to return an unexpended balance of a quarterly allotment for fear subsequent quarterly allotments will be reduced. If all hands combine to save money there will be more available for emergencies.

The cost of the navy ration has been cut down because supply officers are more likely to keep the dollar in mind than are most officers of the line or of other seagoing corps. Comparison of the cost of the ration on various ships has shown large inequalities and has had an excellent effect; the quality of the ration must be and is maintained; the cost of the ration is, in part, dependent on the duty of the ship but additional efforts of supply officers afloat may be able to save the United States additional dollars on every ship of the navy.

The engineering competition is generally effective in saving fuel, gallons or tons, but the saving is sometimes more apparent than real. The purpose of the standards set in engineering competition is to effect economies in fuel expenditure and that it generally effects this saving goes without saying. The natural desire to stand well in engineering competition may occasionally induce unnecessary expenditures of fuel to improve the engineering multiple. The savings are based on the competitive feature of the engineering performances but the advantage to the government of the actual saving of the cost of the fuel is not emphasized. Ask all engineer officers afloat how much money they have saved the government during any specified period by economies instituted, and it is believed that there are few who could give definite replies. Alterations and repairs to machinery should figure in the savings. The usual basis for requesting an alteration is the economy that can be effected by the change in the installation; how many times does the relation between the cost of the alteration and the monetary saving it will effect, enter into the determination of its desirability?

Flag officers can save dollars for fuel by reducing the "standby" time for getting under way, by planning the force exercises and the movements of individual ships so that the greatest result per dollar can be obtained, by cruising in formations that

use the least fuel and, in general, by giving thought to the dollars that any force activity or movement costs.

Captains, executive officers, heads of departments, watch officers and on forward to the seaman second class, have it within their power to save dollars for the government without sacrificing efficiency. Any waste, any unnecessary use, of an article that costs money reduces by a definite sum the amount that is available for the real purpose of the navy.

"Equipage" accounts for more than fifteen per cent of the cost of fleet maintenance and operation. The original cost of equipage is not controllable by officers afloat but the expense for replacement is controllable in a large measure. The possibility for big savings does not rest with those who salvage the used material; the users of the equipage are the individuals who can reduce the number of dollars expended by the exercise of greater care to prevent loss and deterioration or damage. If each officer and man should give the same care to government articles in his custody, or which he uses, that he gives his own property, the bill for replacements of equipage could be lessened and more dollars would be available to purchase new and improved equipment when needed.

The officers afloat can regulate in part the expenditures for "Repairs and alterations to ships, including equipage." Deterioration of material is inevitable and progress means improvement and alteration. It is in the preparation of requests for repairs and alterations that the money cost must be kept in sight. The value to the government in dollars and cents of the repair and alteration should be equal to the charge involved in making the repair or alteration. Repairs and alterations within the statutory limits of expenditures must measure up to this *quid pro quo* basis; an old ship with limited effective life will not repay in service for the expenditures that a newer ship would. Yet the older ship requires more money for upkeep than does the new one. A point is reached in the life of each ship when further considerable expenditure cannot be justified on economic grounds; the determination of this point may be difficult but an appraisal of the value, present and prospective, of the vessel to the navy will be of assistance in making the decision.

The navy is the first line of defense of the nation and expenditures for the navy in time of peace are the premiums paid for insurance against national disaster. The offensive and defensive strength of the fleet is paid for by every taxpayer of the United States and it is a high duty of every officer and man in the navy to use every effort to the end that the taxpayers receive full value in efficiency for every dollar that is appropriated for the use of the navy.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PROMOTION OF LINE OFFICERS OF THE NAVY

By Commander Willis W. Bradley, Jr., U. S. Navy

Several articles concerning the subject of the promotion of the commissioned personnel of the line of the navy have been published in the Naval Institute Proceedings during the last year or two. As would be expected, the views set forth are as many and the suggestions of the means for improving conditions are as far apart as, one might almost say, the stars in the heavens, but it will be nearer the exact truth to say the number of writers whose articles have appeared. Each writer naturally has his own ideas, his own pet hobbies, his own ambitions, or his own disappointments. It is not natural to expect any two officers to look at this question in exactly the same way.

The present writer appreciates that he is no different from the rest. He finds that he is unable to agree with many of the suggestions contained in the various articles and has not hesitated to so state to some of the gentlemen who wrote them. This has led to several requests that he set forth his opinion in what might be called constructive criticism instead of simply expressing it in destructive comment (more commonly called "knocking") of other people's ideas. He wishes to say that such criticism of previous articles as appears herein is given in a most friendly manner and asks that it be so accepted.

In this article it is intended to keep clear of such subjects as amalgamation of corps, desirability of specialists, etc. To include these subjects would make the discussion so drawn out that few people would care to take the time to read it.

The general assumption of many who write on this subject is that our present system of promotion (and of almost everything that pertains to promotion) is all wrong. Some writers are able

to find a few things worth retaining in the present laws. This makes it interesting and furnishes the necessary difference of opinion. Now for once, why not start by assuming that the present laws are fairly good and that the officers of the Navy Department who advocated them, the Congressional committees who drew them, the Congress that passed them, and, in general, the administration responsible for them, went rather deeply into the whole subject and produced laws, unquestionably having their defects, but the best that could be devised at that time? Since such an assumption would be rather refreshing, somewhat novel, and might give us a different viewpoint of the whole matter, I, for one, am going to consider it to be true, rather than that the whole thing was one great mistake.

It seems that this subject may be fairly well covered by asking three questions and by the discussion which must necessarily follow in giving logical answers.

First: Should every officer be retained in the service and be promoted when he becomes due by seniority unless his health fails, he gets court-martialed, retires voluntarily, resigns, or is otherwise separated from the naval service through some means that might be classed as a casualty?

I believe the very general answer to that question is—No!

The experiences of the navy before the days of selection were a very good answer to this question. Although the officers of the navy in general seldom agreed with the Plucking Board in all of its forced retirements, they were always practically unanimous in applauding some of its "selections." I also find that this is generally agreed upon by writers on this subject; for example, Lieutenant Commander Vossler in his article, "Promotion in the Navy" (U. S. NAVAL INSTITUTE PROCEEDINGS, No. 215, January, 1921) provides for the selection out of one half of one per cent of the commanders and of one per cent of the lieutenants and lieutenant commanders, and Lieutenant Commander Blasdel in his article, "A Solution of the Officer Personnel Situation" (U. S. NAVAL INSTITUTE PROCEEDINGS, No. 225, November, 1921) provides for the selection out of officers under certain conditions.

It seems then that we can agree that it is necessary to have some means to prevent every physically fit officer from remain-

ing on the active list until he reaches the age of retirement, that is, sixty-four. Just what this means should be; whether it should be selection out, opportunity for voluntary retirement, retirement for age in grade, compulsory retirement after being passed over one or more times, or some other scheme, is a subject for later discussion.

Second: Should an officer's entire future depend largely upon the age at which he entered the Naval Academy, always considering of course that he is at least an average officer and that he does not "commit" himself; or should there be some means by which he has a reasonable opportunity to get to flag rank if he can convince his seniors that he is just a little better than other eligible officers of his rank?

The old seniority law said—Yes, the age at which a youngster entered the Naval Academy is the greatest single factor in his career when nearing the top of the list for if he were not young when he entered he can never reach flag rank, and if he were not very young when he entered he can never have sufficient time in a flag grade to make it worth while for the department to even consider him for the position of a commander-in-chief. If a young man happened to be near the upper age limit when his opportunity to enter the Naval Academy occurred his chances of becoming a rear admiral were certainly small. He might be the best in the fleet, or even in the navy, but, unless his seniors died, retired, or were otherwise disposed of ahead of him, his case was hopeless; a temporary billet as a chief of bureau with ultimate reversion to the rank of captain was the best he could really hope for.

If such were the case under the system of seniority in the days of small Naval Academy classes, what would it be in twenty years from now when the classes of 1906 to 1910 and even lower begin to get near the top? Would the youngster who entered the class of 1909 at the age of nineteen have the slightest chance of getting flag rank? Most certainly not—not even the chance of the bootblack who aspires to become a bank president, for there is no law to stop him while the law of promotion by seniority was a stone wall which none could pass so long as younger men remained on the active list ahead of the aspirant in sufficient numbers to fill all vacancies. How does one think the contentment of

officers with such prospects would stack up with their contentment today? Under the present laws, they see every opportunity for advancement open ahead of them; under the old seniority laws they would form a large part of that "disheartened, disgruntled, and unhappy personnel" which Lieutenant Commander Blasdel mentions as now existing and the existence of which he blames to the present personnel laws.

The present promotion law says—No, an officer's entire future shall not be dependent upon whether his Congressman had an appointment to the Naval Academy available when this officer was a lad of sixteen or of nineteen. It says, in other words, that if the individual officer will so shape his career that his record and his reputation in the service show him to be a better man than his compatriots he can look forward with a reasonable degree of assurance to reaching flag rank. It also says that if he gets to flag rank he will be young enough so that he can have every opportunity to demonstrate his ability to command a division or a squadron and thus to show that he is the proper officer to be made a commander-in-chief.

The present law does not put the boy who enters near the upper age limit upon an exact par with the one who enters near the lower limit for as these officers approach the retiring ages of the various grades the younger will probably have more opportunities for selection than the older. There is no objection to this feature since the navy can expect somewhat longer service on the active list from the younger man.

Again referring to the two articles previously quoted, it is noted that while Lieutenant Commander Vossler makes provision for the possible selection of up to three per cent of the officers in the grades of lieutenant commander, commander, and captain, Lieutenant Commander Blasdel does not make any provision for such selection up, he maintaining that such a provision is unnecessary.

The writer believes that almost every officer will, when he considers the subject carefully, agree that a satisfactory system of promotion must be such that an officer of ability (say "exceptional ability" if you care to do so) will be afforded an opportunity to get to the top even though he may be sufficiently unfortunate as to be a year or more older than other officers of his date. To deny such an opportunity to these older officers

certainly tends to reduce their ambition and fails to furnish any incentive for their development as "exceptional officers." Such a denial would certainly tend to set up a class of officers as dissatisfied in some ways as those now are who have failed to be selected. The great difference would be that there would be more "without hopes" than there now are "passed overs" and that those "without hope" would never have had a chance to gain promotion by a demonstration of especial fitness while those now "passed over" are at least supposed to have had such an opportunity.

Which would be the better for the navy? There may be arguments on both sides but, personally, I believe that every officer and man should have a chance to reap the highest rewards if he has the ability to do so. For the purposes of this discussion I am, therefore, going to assume that the answer to the second question is that an officer's future shall not depend to such a great extent on his age when he entered the Naval Academy, that he is barred from the highest grades if he were eighteen months older than the average of his class.

Third: Recognizing the fact that it is nécessary to eliminate a certain small number of officers from the navy for demonstrated lack of efficiency or for other kindred reasons and that it is essential that every young man who graduates from the Naval Academy and is commissioned shall have a reasonable opportunity to go to the highest grades, what system or method are we going to adopt to accomplish these results?

Let us first consider the means of eliminating from the active list those officers whom the service at large (necessarily represented by some sort of a selection board) deems unworthy of promotion. There are several means of carrying out this elimination, the most ordinary being by selection out (plucking), by retirement for age in grade, by offering an attractive voluntary retirement privilege, by compulsory retirement after an officer has been passed over a certain number of times, or by an involuntary transfer to a reserve corps (inactive status).

Although selection out is advocated by Lieutenant Commander Vossler this method seems to me to be unnecessary, to place a certain undesirable stigma on an officer selected out, and last but not least to be unworkable with the form of government estab-

lished in the United States. When an officer is selected out it is impossible for him or for anyone else to think of his case without involuntarily concluding that there must have been something wrong with him and that the selection out was really only an easy method of firing him. In some cases this may be so but, in nine cases out of ten at least, the officer so selected out has not committed any offense justifying so severe a punishment, he has simply not measured up to the standard of efficiency set by the great majority of his brother officers. Why, then, should such a stigma be placed upon an officer? My answer is—It should not be so placed. There are other methods of accomplishing the same result from the navy's point of view, with an entirely different result from the eliminated officer's point of view. I know that advocates of such a system as the one suggested by Lieutenant Commander Vossler will say that if an officer did not deserve to be selected out he would not be so selected since according to that system no specific number is designated to be eliminated. I think that this is false reasoning for by assuming that this is true one must concede that no one will ever be eliminated for inefficiency or that the selection board will be infallible in its findings and recommendations. The mere fact that selection boards are composed of representative human beings and are subject to ordinary frailties, likes, and dislikes, is the greatest reason usually advanced for doing away with the present method of selection. Selection boards, whether for selection up or for selection out, have made mistakes in the past, are making them now, and will continue to make them in the future. There is no Utopia for the candidate. It can't be achieved so long as mankind runs the board. There is too much chance for a mistake in selection out except as a last resort. An error once made cannot be rectified or even mitigated except by a restoration to the active list by act of Congress—something that experience has shown rather difficult of accomplishment. For the reasons suggested above the writer rejects "selection out" in any form as the best method of eliminating supposedly inefficient officers from the active list.

It might be noted in passing that the writer has carefully considered the suggestions in some articles that the defects of selection out might be corrected by giving an officer selected for retirement the right to demand a court of inquiry in his particular

case. This does not appeal to me since it would keep the navy's grievances always before the public eye and would soon lead people to believe that worthy officers were being railroaded out of the service to satisfy spite, jealousy, and other undesirable attributes.

Retirement for "age in grade" is a means of eliminating certain officers from the active list that does not seem to be open to any serious objections. There is absolutely no stigma attached to an age in grade retirement. It is a clean-cut retirement which allows one to go before his friends, the public, or a prospective employer, and to state plainly and without evasion the real cause of his retirement—that he was simply a little too old for his place in his grade on the active list. With the exception of voluntary retirement this seems to be altogether the best method of eliminating officers from the active list. It is believed that there can be very little question of the necessity of retirement for age in grade if there is to be a steady and healthy flow of promotion, without which the officers of the higher grades soon get too old for their billets and those in the lower grades soon get tired and discouraged waiting for some of the older ones to retire or die.

It is noted particularly that some officers who object to the age in grade retirement are prone to point to the promotions of the past five years as a sure sign that such retirements are not necessary (age in grade retirement not becoming fully effective until December 31, 1921). To see the fallacy of this argument one only has to look at the expansion of the naval personnel during this period and to compare that expansion with the probable expansion during the next ten years. There is certainly nothing to indicate that there will be any great expansion of the navy during the next decade.

The easiest method of creating vacancies to allow of a healthy flow of promotion is by voluntary retirement. The great trouble with this method is that normally the most active and energetic officers are the ones who see an opportunity of making good in civil life and that these, who can least be spared, are the very ones who will most often take advantage of a straight voluntary retirement offer. Even at its best it is to be expected that this method would let out more good officers than poor ones. On

this account no voluntary retirement privileges should be granted as a right (except in the case of officers "passed over"). Such a privilege should be "in the discretion of the President" thus allowing the department to hold any officer deemed especially desirable to the service.

After all has been said about elimination by "selection out," "age in grade," "voluntary retirement," etc., there is no question but that to get those officers on the retired list whom it is for the best interests of the service to have there it is absolutely necessary to use compulsion in some form. One of the best methods of such compulsion would be to retire officers involuntarily if they had been passed over a certain number of times after becoming eligible for selection. The best sort of a law for such retirement would be one which provided that any officer who was passed over could avail himself of the privilege of voluntary retirement at once; that any officer who was passed over a second time would be placed on the retired list sixty days after the date of the approval by the President of the findings and recommendations of the selection board which passed over him the second time, unless sooner retired voluntarily. It is believed that such a law would have three very beneficial effects: first, it would make the selection boards consider even more carefully the records of officers whose records show doubtful efficiency; second, it would provide a means of immediately getting off the active list for those officers who feel insulted, unfairly treated, or that their efficiency and usefulness have been ruined by the action of the board; third, it would furnish a means of compulsory retirement for those officers thus passed over, first giving them every reasonable opportunity to be placed on the retired list at their own request and thus escape any possible stigma of being "plucked" or otherwise forced out. This would completely do away with the small disgruntled element now on active duty who believe that their merits have not been properly appreciated by the various selection boards.

In this connection the writer desires to state that he believes that there is entirely too much made of the supposedly large element dissatisfied and disgruntled over present conditions. From a casual observation it may be said that nearly every officer passed over takes his medicine without complaint and settles

down to try to convince those in authority that he is worth much more than his record indicates. It seems to the writer the greater part of the agitation for radical changes and the greater number of claims of unjust treatment come from the friends and families of officers rather than from the officers themselves. Perhaps some of these statements are "inspired" but I believe the greater part of them are not.

Considering now the requirement that a perfectly satisfactory system of promotion (if such is even remotely possible) must provide some means of allowing the most efficient men to get to the top, even though these most efficient officers happen to be one or two years older than they should be, we are compelled to acknowledge that a straight system of promotion by seniority (without an enormous number of retirements in the highest grades) will not and cannot accomplish the purpose. To get the most efficient to the top and to keep them for any reasonable length of time absolutely requires some sort of a selection system.

I am aware that the conclusion herein mentioned is directly opposite to that drawn in Lieutenant Commander Blasdel's article in which he proposes that discrimination due to age shall be overcome by promotion to all grades after a given length of service in the preceding grade. He proposes that whenever the number of officers in a grade exceeds the number of officers authorized by law for that grade, the excess shall be either retired or placed in a reserve corps, and that they should then be employed to fill civil positions under the government. He does not say what he would pay them upon such transfer but it is assumed that they would be allowed a graded retirement pay of something like two and one-half per cent for each year of active service. Lieutenant Commander Blasdel states that there would be eventually about 1,600 captains on the reserve list and a proportionate number of other officers. Such numbers are, in my mind, entirely too large for Congress to even seriously consider such a proposition. I am one of those to whom he refers when he states, "Some emphatically state that Congress would never pass anything like that." Right there my agreement with him ends for I cannot concur in the next sentence, which reads, "This is ridiculous, for they are only retaining the services of those the

country has paid to educate, and employing them in positions, the total pay roll of which today is far and away greater than the total pay of all officers on the reserve list would amount to." For the sake of argument we grant immediately that the total pay roll of the various political and civil appointees who could be replaced by officers of the reserve list is greater than the difference in pay between the active and retired pay of the officers necessary to replace them. I think it questionable whether or not the total pay is greater.

The advocate of any such scheme must ask himself what kind of positions these reserve officers (especially the senior ones) will be willing to accept. Certainly they are not going to accept any of the ordinary civil service positions with salaries around $2,000 per year. They will insist on positions which seem in some way commensurate with their rank. This will restrict the available positions to those now occupied by relatively high salaried government employees. Does it not seem that the navy's experience with the lighthouse service and with fairly recent laws passed to restrict the employment of retired naval officers (such as the one concerning the acceptance of diplomatic or consular offices, the law regarding employment with firms doing business with the navy, etc.) are a sufficient answer to the probability of any long continued assignment of retired or reserve officers to desirable civil service or political positions? It is possible that Congress might relent, under pressure of economy or some other transient cause, and permit or even order the employment of retired officers in such positions but,—who believes that this would last for more than a year or two? The writer believes that the power of political appointments, this so-called "patronage," is too strong a factor in American political life to be lightly swept aside in favor of any one class of people, even though there might be some considerable pecuniary advantage in so doing. In the long run, a great many politicians are not so much concerned with the exact amount of money spent (so long as the treasury can supply it without new taxes) as they are with the proper maintenance and repair of their own particular political fences. This is an acknowledged fact in almost all modern forms of government. The opponents to the policy of filling up the consular corps or the diplomatic corps with retired or reserve officers

may also use the very legitimate objection that these same officers would, in all probability, be recalled for active service in case of hostilities—at the very time when experienced and well-known officials would be most in demand. Needless to say, a diplomatic or consular officer who "knows the ropes" and the people is a valuable man and is one who usually becomes more valuable as world relations become more strained.

Of the various forms of selection, the following seem to be the most acceptable and widely discussed:

Unlimited selection.

Limited selection; requiring certain service in the preceding grade before becoming eligible for promotion: requiring a certain amount of sea service in the previous grade, etc.

Selection of a certain percentage of eligible candidates for promotion; other vacancies to be filled by promotion by seniority.

Unlimited selection would open the field to so many evils that it is hardly to be considered seriously. There is certainly no real argument in favor of such selection except that it would make it possible to get the best men to the top regardless of age or time in grade. Such a procedure may be seriously objected to on the grounds that exceptional brilliance in one grade, without adequate service in that grade, is not any criterion of what would be accomplished in the next higher grade. It may also be truly stated that since a large part of any naval officer's education comes through actual experience in ships, no line officer should be permitted to pass through a grade without reasonable length of service in that grade. The objections to such forms of selection certainly so much outweigh its advantages that it will not be further considered in this article.

Limited selection is the form now in use for the line of the navy for all grades above lieutenant commander. In this form of selection, as used at the present time, no officer may be selected to fill a vacancy in any grade unless he shall have served in the next lower grade for a period of four years, two years of which must have been at sea. The wisdom of this provision ought to be apparent to all. It assures a reasonable amount of service in each grade for each officer. There may be some question as to whether the length of service required is too much or too little but it is believed that it is a reasonable compromise and

therefore not open to serious objection. In this form of promotion every officer must be selected to gain promotion to the next higher grade.

In Lieutenant Commander Vossler's article he proposes a limited selection; a selection of candidates to fill a certain percentage of the available vacancies and the filling of the remaining vacancies by promotion by seniority of those officers remaining. By this method he expects to get the best officers to the top and at the same time give every officer the certainty of promotion as a reward for length of service. As can readily be seen this method is neither fish nor fowl; it is a compromise; an endeavor to placate both the "selectionists" and the "anti-selectionists." Lieutenant Commander Vossler proposes to have these selections made by a "selection board," presumably of the same general character as the present selection board.

The writer is unable to discover any good reason for using any selection if it is not to be used entirely. It seems to me that if selection is right it should be used, if it is wrong it should not be used, but that halfway measures are simply a makeshift and cannot stand. From what can be learned, the reasons for this partial selection are based largely upon the supposedly certain injustice done to many officers by the selection boards, due to the great similarity of officers' service records. It seems to be based upon the idea that a selection board cannot properly select all the officers for promotion but can select a certain number. Just why this is, is certainly hard to see since it is the same board doing the same business in both cases. Lieutenant Commander Vossler mentions as a criticism of the present selection board that the "personnel of practically every selection board is different from the preceding one. This cannot help but result in certain changes in policy in regard to making selections, as evidenced by the fact that frequently in the past an officer rejected by one selection board has been selected by a subsequent board," etc. Would the board he advocates be any different? Would it not have an ever changing personnel?

When one comes right down to hard facts isn't it desirable to have a change in the personnel of selection boards once in a while? By doing so candidates in general are certain to have a much more characteristic board than if one set of officers served

for years, always using a set policy. Furthermore, why always assume that the promotion of an officer once passed over shows that a mistake was made by not promoting him before? It may simply be that that officer wasn't considered as good as those previously selected for promotion but that he stands high among those now available: it may indicate that he has shown a decided improvement as shown by his fitness reports, in naval parlance he may have "snapped out of it": it may be that where only a few are selected the board has exercised exactly the same prerogative it would have to exercise in the proposed selection of a small percentage only, that those previously selected were all men of "exceptional merit." One can easily think of a good many reasons why a later selection is not necessarily a mistake in itself and why it does not show with any certainty that an error was made when the officer in question was passed over. Unfortunately the average officer does not make the slightest effort to justify the selection board unless he agrees with its findings, he simply points it all out as a mistake and as a "horrible example" of what the present system does for us.

Lieutenant Commander Vossler further states that the present system fosters "more or less jealousy among officers," etc. Is it possible for any system, even seniority, to do other than foster a certain amount of jealousy among us? It is only a question of relative jealousy in any case. The writer of this article believes that the jealousy would be more acute in the case of selecting only a very few for promotion than it now is with the selection of the many. In the one case, about ninety-five per cent would be more or less jealous; in the other case, only five or ten per cent are the jealous ones. It seems that ninety-five per cent would do much more to "reduce co-operation and co-ordination throughout the service" than the five per cent. This appears to be only common sense.

The writer has heard much criticism of the various selection boards and of their methods of carrying out the unpleasant duties assigned to them. The general trend of this criticism is that through favoritism or some other illegitimate means certain persons are selected while through dislike others are passed over. Many of those who criticise believe that the board does not take sufficient care in making its selections and does not adequately

scrutinize the records of all officers available for promotion. This can hardly be the case for the law under which the selection board was created and is now operating provided very distinctly that "The report of the board shall be in writing signed by all the members and shall certify that the board has carefully considered the case of every officer eligible for promotion under this law, and that in the opinion of at least six members, the officers therein recommended are the best fitted of all those under consideration to assume the duties of the next higher grade," etc. How can one get a more binding certificate than this? To assume that all cases are not adequately considered is to impeach the integrity of the board, a thing hardly to be seriously thought of since the board is composed of naval officers of long standing and much experience. We might as well say that honesty does not exist in the service as to say that nine rear admirals would sign such a certificate without having actually carried out its requirements.

It is undoubtedly true that officers' records do not show the real differences that exist between the officers they represent. Owing to the almost uniform desire to do the square thing by every officer in the service, commanding officers are very reluctant about giving any commissioned officer an unsatisfactory report or, in fact, any report below the "very good" class. While this attitude is very commendable, it is questionable whether or not the best interests of the service are being served thereby. With straight promotion by seniority, uniformly "very good" or "excellent" marks and records did no real harm if the really inefficient officer were actually singled out and marked accordingly. There was nothing to be gained or lost (so far as the whole service was concerned) whether an officer good enough to be promoted had a record which might be classed as "good," "very good," or "excellent." It is that fact that is largely responsible for the habit we have acquired of marking everybody in the "very good" or "excellent" classes.

With promotion by selection, all this is changed. When we come to the proposition of picking the best five out of perhaps twenty officers and allowing the other fifteen to retire for age in grade, records are of the utmost importance. Commanding officers should certainly change their methods of marking and give an officer the classification that he actually deserves. The

captain of a ship almost invariably knows just about where an officer belongs in the scale of efficiency. He should see that the marks he assigns put that officer in his proper relation with others in his ship and in the service at large. Many will protest that the captain of a ship is largely influenced by local and perhaps accidental happenings and cannot give those under him a classification that will do them justice. This might be so in certain isolated cases, particularly in the case of an officer who changes duty quite often, but in the long run it is not considered very probable. The average captain or flag officer does not base his estimate of the value of an officer (more particularly one of considerable rank) upon accidental or transitory happenings; he usually sees the reasons for such accidental things and certainly bases his estimate of the real value of an officer upon his consistency of accomplishment, his conscientious performance of duty, his ability to get results, not just here and there, but all the time. It is easy enough for the commanding officer to conclude that an officer under him belongs in the upper or in the lower strata of officers (taken as a whole) when classed according to their efficiency. His judgment will seldom be wrong. We must accept the few errors that are made as the price we pay for our lack of ability to produce perfect naval officers, perfect men, or perfect judges of human character and ability.

The present "Reports of Fitness for Officers" are hardly sufficiently explicit to get the best evidence of an officer's ability or lack of ability before a board. The writer believes that they should contain some very explicit questions; such as will not permit of evasive or general answers. The following are suggested as a guide of what is intended:

1. Considering only officers of the grade of this officer:—
   How many do you know sufficiently well to mark for efficiency? ....
   Where do you place this offcer among those you know sufficiently well to so mark? ....
   How many are there under your command? ....
   Where do you place this officer among those under your command so far as his efficiency is concerned? ....
2. As a member of a selection board would you select this officer for promotion to the next higher grade? ....

If the answer to the above question is "yes," would you select him ahead of his regular turn, in his regular turn, or after his regular turn? ....

3. As a commanding officer would you desire this officer under your command? ....

If you would desire him under your command, in what position would you wish him to serve? ....

It may be suggested that it would be very difficult to answer some of the above questions, particularly those under paragraph one. This is just the thing that is intended. It is believed that those officers assigning marks should be obliged to think and figure; to stop and compare the officer under consideration with other officers of the same rank whom they know; to estimate in their own minds whether or not the officer under consideration is deserving of special consideration; in general, to use sufficient thought on the whole matter so that the record as made up will present something concrete rather than a mere statement that the officer is "average," "above average," or "below average."

A great objection to selection is based upon the fact that the members of the board do not, and cannot, know personally all or even a large part of the officers under consideration for promotion. There is some merit in this objection but hardly as much as one might think at first glance. It is granted that the members of the board probably know very few of the lieutenant commanders available for selection to the grade of commander. There is no real objection to this condition since promotion from the grade of lieutenant commander must consist mainly of passing over these officers whose records indicate that they are not up to the standard of efficiency required.

As time goes by an officer naturally becomes better known in the service so that by the time a commander becomes eligible for promotion to the grade of captain he should certainly be fairly well known to at least some members of the selection board. This will make the selection somewhat more rigid than it was from the grade of lieutenant commander to that of commander.

By the time an officer is eligible for selection to flag grade his acquaintance with members of the selection board, the sufficiency of his record, and his reputation in the service should, and probably are, matters that need little discussion. If an officer is

not quite well known by that time, if his reputation as an efficient officer is not well established, if his record (covering probably at least thirty years of service) is not sufficient for the board to establish a fair and just estimate of his ability, then there must be something so lacking in that individual's make-up that it is not unreasonable to conclude that he is hardly the man to be a flag officer in the navy.

It does not seem that there can be any real argument against selection for flag grades whatever merit there may be in objections to its use for other grades. The mere fact that there can never be more than a small percentage of officers to reach flag grades, and yet allow those who become flag officers to serve a reasonable length of time in those grades, makes it essential that only the best captains are promoted. The great difficulty is to find some means whereby the best may be secured. The present system (with certain minor modifications) seems about as good as can be devised at the present time.

CONCLUSIONS

The writer is well aware that the conclusions he draws from the above discussion will not be found acceptable to many officers. He doesn't need anyone to tell him that the present laws are very unpopular among certain officers; but he believes that the whole thing boils down to what is for the greatest good and the best interests of the navy regarded as the bulwark of national defense, not as a means whereby the governnment agrees (either in writing or by implication) to furnish satisfactory employment for any certain person or class of persons.

The writer's conclusions are:

(a) That the present laws for the promotion of commissioned line officers are generally satisfactory to the service and should not be radically changed. Certain minor modifications are desirable.

(b) That the principle of selection up is fundamentally sound and should be continued for promotion to the grades of commander, captain, and rear admiral.

(c) That an officer once passed over should be permitted to retire voluntarily in his grade on a retired pay based upon his actual length of commissioned service.

(d) That an officer twice passed over should be placed upon the retired list with graded pay at a date approximately sixty days after the approval of the recommendations of the selection board that last passed over him. He should be permitted to retire voluntarily during this sixty days should he care to do so.

(e) That reports of fitness of officers should be more in detail and should require more specific answers (especially for officers serving in grades from which promotion is by selection).

(f) That selection out should not be used in the navy.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PEACE-TIME NAVY AND MERCHANT MARINE

By Lieutenant P. V. H. Weems, U. S. Navy

During war-time emergencies the merchant marine, or as much of it as is needed by the government, is taken over, and becomes as much a part of the government as the navy itself. When the emergency subsides, the merchant ships are returned to the private owners or sold to reimburse, partially, the government for the original cost, and again the naval and merchant services become distinct and aloof. When there are no wars or rumors of wars, a narrowness of view, one service for the other, becomes apparent. The merchant service working through the labor unions hampers naval reserve legislation and displays a certain amount of narrow prejudice against the navy, due perhaps to the unfounded fear that surplus naval personnel will reduce the number of jobs available for the personnel of the merchant service. Another objection advanced by the merchant marine, in some cases, to closer co-operation with the navy, is the irksomeness of naval discipline. At the same time, through failure to realize the possibilities of service in the merchant marine, naval officers and men, with some exceptions, have decided aversions for any sea service other than that in the regular navy.

The upkeep for an adequate navy is so expensive that it becomes more and more obvious that the economics of the navy must be given due consideration by the parties responsible for the administration of the navy. For instance, how would the situation be met if it developed that the pay of navy personnel was suddenly reduced to half the amount normally expended? Would half of the personnel be cashiered? Would the quality of the personnel be lowered by giving lower salaries? Or would an endeavor be

made to hold a portion of the excess personnel in an active reserve, and constantly ready for service in the navy?

Closer and more efficient co-operation between the navy and the merchant marine is entirely possible, and would result in a financial saving to the government, though the method required and legislation needed to bring this about are not so evident. The object of this paper is to bring out some points in favor of better teamwork between the two services, and to state some facts which militate against such teamwork. The taxpayer is in no mood or financial position to pay a huge ship subsidy or to maintain an expensive navy. If by co-operation between the navy, including the coast guard and lighthouse service, and the merchant marine, the navy can become indispensable to the merchant service, and the latter made profitable, then public opinion as well as the government will be squarely behind both services.

Some of the logical results of this co-operation, if put into effect, would be a reduction of overhead costs, less duplication of operative personnel, docks and repair facilities, and greater smoothness and efficiency of radio communication. The presence of navy personnel on board merchant ships would also help to insure proper consideration when American ships are in foreign ports, which is not always the case by any means.

The average taxpaying citizen cannot see why the navy cannot be put to some other economic use than solely that of protective insurance. Doubtless many people wonder why the many naval vessels cannot at least carry fast mails and perhaps light cargo. It is also little known that legislation was brought before Congress only a few years ago to have the navy maintain a line of fast mail carriers to foreign ports. The legislation failed to pass yet it shows what might take place at any time. This idea was recently expressed in Europe for standing armies in peace-time. Mr. Richard Spillane writing about "a novel plan for the rehabilitation" of Europe, as laid before the League of Nations by an Englishman with experience in the World War, states that eighty per cent of the time of the various armies was spent on engineering construction work. The concrete idea as given by Mr. Spillane follows: "In the engineer corps of each army there is high skill. This is not utilized in times of peace for human progress and

betterment. He suggests that the League of Nations utilize its International Finance Corporation to enter into contracts with each of the European states to develop their resources, such as railways, canals, harbors, mines, forests, hydro-electric enterprises and various dormant industries, the Finance Corporation to issue bonds secured on the various public works and guaranteed by the states. The army engineers and the troops of the states should carry out the work." At first sight this might appear to be a radical scheme, yet it is a safe prediction to say that a parasitic military or naval force will be far from popular with the taxpaying citizens during the next ten years.

An item recently appeared in the press to the effect that Congress is considering the advisability of utilizing one third of the naval officers below the rank of lieutenant, in the merchant marine by having the shipping companies pay one half of the officers' salaries, and the navy pay the other half. In effect this would be a subsidy; on the other hand it would provide the nation with an active reserve ready for instant service in the navy. As a matter of fact, it also might result in preventing a shifting of personnel by having the proper navy personnel on certain merchant ships at the outbreak of hostilities. It should obviate the necessity of hurriedly enrolling numerous officers to serve on board merchant vessels as was done when the United States entered the World War.

In private conversation, many naval officers interpose some of the following objections to closer co-operation with the merchant marine: "Naval officers have enough to do to keep up with their own jobs"; "A naval officer's profession is too highly specialized to permit such diversified work"; "The navy was made to fight"; and similar arguments. Some of these points are well taken, and theoretically, most of them are correct, but these arguments will not stand careful analysis. Some of the principal duties of a naval officer come under the heads of: (1) engineering, (2) navigation, (3) seamanship, (4) international law, and (5) handling men.

A young naval officer holding down the job of chief engineer of a 10,000-ton merchant vessel running on a close schedule with half the number of men he might have been accustomed to in the navy, and this on half the allowance he had previously been

given in the navy, certainly has as favorable an opportunity to learn practical engineering as a brother officer busied with the upkeep of the engineering plant of a small naval vessel, and with the operation of this plant only when the allowance of fuel oil permits. Moreover, the merchant marine personnel are paid for overtime when worked over eight hours, and the discipline is lax. In other branches of work it is much the same proposition—less men and material to do the same work.

Captain Felix Riesenberg, in his excellent book, *The Men on Deck,* writes as follows: "The British merchant service is at the present time strongly advocating commissions, by the government, for merchant marine officers. With our Shipping Board, and with the growing control by military and naval authorities over merchantmen, some such plan might be advisable for American merchant marine officers, and would undoubtedly help to elevate the standards, and bring the naval and mercantile services into closer harmony.

"The British merchant service association are also agitating the question of some sort of standard uniform for merchant service, officers and men.

"This is a good idea, and should be adopted by Americans. The writer, however, would not advise the adoption of the naval blouse. This is the property of the U. S. Navy. . . ."

The idea expressed by Captain Riesenberg drives straight to the point, that of bringing the "naval and mercantile services into closer harmony." The layman would ask why harmony does not already exist. It is more a question of aloofness than that of lack of harmony, and this aloofness arises from various half-hidden reasons. One cause resulting in a certain amount of ignorance of one service regarding the other, is the fact that the merchant service comes under the administration of the Department of Commerce, and, as is most natural, this department shows an independence in the rules and regulations promulgated for the governing of the merchant service. Where exactly the same end is desired, and under practically the same conditions, the two government departments will employ different methods. On the other hand, it can be truthfully said that the regulations for the two services are surprisingly alike, and the differences more apparent than real. To one acquainted with the Navy Regulations,

the rules and regulations for the merchant service will seem logical, and most of the information, in different words perhaps, will already be known. The international rules for the prevention of collisions at sea, international law, and the international code, apply, of course, alike to the navy and the merchant marine. The best textbook on modern seamanship, *Knight's,* is used in both services. Many of the customs are the same for both services. Many of the engineering problems are the same. The navigational problems are much the same in practice, although the examinations for master's license requires a knowledge of the old time-sight method, courses in points, and orders to the steersman to be given with reference to the helm and not with reference to the rudder as is the case in the navy. The duties of specialists such as radio operators, might be said to be identical.

To a naval person, the hardest part of the examinations for the merchant marine is the definitions applying to the merchant service, and to the stowing of cargo, all of which the naval person should know. An evident need in the navy libraries is a comprehensive book covering the entire subject of what every naval officer should know about the merchant service, except engineering and navigation, which subjects are covered thoroughly by naval textbooks. To prepare for the master's examination, a naval officer will probably find it necessary to rummage through books on international law, naval construction, seamanship, and navigation, and finally have recourse to an encyclopedia or an unabridged dictionary, unless he contents himself with incomplete data found in the small special books usually written as a "gouge" for the examinations.

The duties in the merchant service, except purely military, are much the same as those in the navy, and contrary to the usual opinion, the laws made to maintain discipline are not unlike, if applied in the same spirit. Such crimes as piracy, barratry, mutiny, and murder are punishable as prescribed by national law. Corporal punishment has been abolished as has been done in the navy. The more common offenses with the assigned punishments are as follows:

First. Desertion, forfeiture of clothes and wages.

Second. Absence over leave, two days' loss of pay, or expenses incurred for hiring substitute.

Third. Absence without leave, one month's loss of pay.

Fourth. Disobedience of orders, four days' loss of pay, one month imprisonment, or the use of irons if necessary.

Fifth. Continued disobedience and neglect of duty, placed in irons, on bread and water, full ration every fifth day, till disobedience shall cease, loss of twelve days' pay or by imprisonment not over three months, at the discretion of the court.

Sixth. Assaulting master or mate, two years' imprisonment.

Seventh. Embezzlement or wilful damage to vessel, loss of wages sufficient to cover damage, and at the discretion of the court, twelve months' imprisonment.

Eighth. Smuggling, loss of wages to replace loss, also imprisonment for twelve months.

Taking into consideration that the first offense for navy men under eighteen is not considered desertion regardless of time absent from station, and the fact that loss of pay is remitted, subject to future conduct, the punishments for similar offenses are not altogether out of proportion. It becomes more a question of how discipline is enforced, than the means to enforce it.

To quote again from Captain Riesenberg: "The etiquette of the bridge, in the merchant service, especially on the large liners, is as formal and stiff as that on any battleship. The heights of responsibility are always on high tension. In the lesser trades, on tramps and the like, officers are more lax, though they should be no less vigilant.

"Salutes are given and returned (on the liners) and uniform is worn.

"Relieving officers should be on the bridge at least five minutes before eight bells."

The professional examination for an able seaman covers practically the same ground as the "A to Z" subjects in the *Bluejacket's Manual* for seaman first class in the navy.

It is easy for a naval officer to believe that regular line service is absolutely necessary to his successful professional career, and that service in the merchant marine would mean losing touch with the constant progress being made in the navy. The work and knowledge required in the merchant service means to the average naval officer or man eight hours of union labor per day and only

the knowledge necessary for the special work undertaken; that engineers, for example, would have no interest outside their department, and that each person would stick to one job, narrowing his view of other work. This attitude, if we are to judge of the conditions "as is" and not as they should be, is partially justified. On the other hand, it is submitted that there is plenty to learn by the merchant marine officer or man, and that a navy person serving in the merchant service would, while losing out in some lines, be the gainer in others, which would at least partially counterbalance the loss of knowledge resulting from the absence from a man-of-war.

Taking the conditions as we have found them in the navy during the past two years, service in the merchant marine would have been more active than that in the navy. For instance the navigator, engineer, and the seamen, would have had more opportunity to practice their trades because they were at sea more. There is so much more to be known to make an efficient officer than the mere routine and professional work that the varied experience to be gained in a merchant ship would prove beneficial to a naval officer. In this connection, the sea training of John Paul Jones is enlightening. At the age of twelve he had become a seaman's apprentice and made several trips to America. Later he rose to the grade of mate and finally master in the merchant service. Some of his most valuable experience seems to have been gotten while in a slave ship. Previous to entering the young American Navy, the only naval experience Jones had was a few months in the British Navy as acting midshipman, yet the lack of naval experience did not prevent him from becoming in a short time one of the greatest sea captains in our history. His better spirit rebelled against the life on a slave ship, yet he continued on in the merchant service, and in this service he killed with a belaying pin a mutinous negro in order to maintain discipline. The experience Jones gained in slave and merchant ships did not appear to have a bad effect on his qualifications as a naval officer. Another interesting case is that of the sea captain, Bucknam, who was made an admiral in the Turkish Navy.

The benefits to be gained by the merchant marine through closer co-operation with the navy would be felt some years hence rather than immediately. A great deal of prejudice, while perhaps

entirely human yet no less detrimental, would have to be overcome. Recently there appeared an editorial in the *Philadelphia Evening Bulletin* under the head of "Surrendering to Prejudice" as follows: "Dropping the naval reserve clauses from the Shipping Bill is a surrender to the prejudices of organized labor, who profess to fear that the enlistment of officers and crews of the merchant marine in the reserve service of the United States Navy would constitute an encroachment of their rights as citizens.

"Their protests are based on the assumption that the right of the government to call the reserve into service in the event of an "emergency" might he utilized for the purpose of breaking a marine strike. Chairman Lasker, of the Shipping Board, in his opening address to the House Committee disclaimed any such purpose, declared that it was intended that the bill should explicitly avoid any such contingency, and offered to accept any definite amendment to that end.

"The prejudice which prevails in organized labor against the National Guard, however, appears to have been insurmountable. Votes in Congress against the Shipping Bill were threatened, if these patriotic provisions were not stricken out. The naval reserve will be authorized in separate form.

"But why should the interests of a trade union and of a reserve for national defense, either in army or navy, be in conflict? Why should an effective reserve for national safety prejudice the rights of any man in any legitimate trade, or its organization?

"The Shipping Bill contemplated a payment, beginning at $650,000 the first year and ultimately reaching $3,000,000 per year, for the voluntary enlistment of a force expected to number 5,000 officers and 30,000 men, trained and ready for emergency naval service. What is there in that, derogatory to any right of labor?"

The interesting point in this editorial is that it shows that there is a prejudice against the closer co-operation between the navy and the merchant marine on the part of organized labor as influenced by the seamen's unions, where no such prejudice should exist. If there is any justification for this state of mind, the cause of it should be removed; if not, the unfounded prejudice should be overcome by convincing the responsible heads of the unions of their error.

A great many of the American youths who enter the merchant service do so with the idea of reaching the grade of mate or master. A successful seaman who has risen to the grade of master mariner, while wishing the just personal rights of seamen assured, would certainly be in favor of sufficient discipline to insure efficient management. After all, should not the successful man's judgment be taken as against the numerical majority who are inexperienced or ne'er-do-wells? Especially should the ideas of the more experienced men be accepted, since the ideas of the younger men, though radical and different at first, will veer round to the ideas which the older men hold. A good portion of the objectionable feature of the La Follette Act is based on undue attention to the welfare of the seaman. If the results of the law were entirely to the advantage of the seaman there would at least be one logical reason for keeping the law on the statutes, but a careful analysis will show that while the law certainly has many good points, there are also many features which are meant to benefit the seamen but really result to their disadvantage. The most conspicuous defect is the requirement for a certain minimum crew. This results in less pay and advancement for the seamen since the shipping concern will have less earnings. At first sight, by permitting fewer men to do the work, the number of jobs is cut down, but the fallacy here is that due to competition of foreign bottoms the number of ships flying the American flag is cut down with the result that the total number of jobs is ultimately reduced. If half or two-thirds of the crew are Americans, who hold the responsible positions, the foreigners in the less responsible positions would be only an economic gain to our shipping, since our surplus youths could turn to other and better jobs. The fact that fewer men are carried would not necessarily mean an excessive hardship on the men, for the manpower released is usually replaced by labor saving machinery. Besides, the biggest advantage America has is the fact that one of its men is the equivalent of two of some of the less efficient foreigners—at least they would become so, if left unhampered by restrictive laws. A good example of a purely American initiative is the method of handling the efficient 10,000-ton lake boats. With a crew of thirty-two, which would be reduced to twenty-seven or less if the law permitted, and with about six deck hands,

these fine boats come alongside a pier, load 10,000 tons of ore in as low as one hour, steam to destination and unload this cargo in as low as ten hours. These boats make regular runs and the crew are signed up for six months and in some cases practically make the ship their homes. While there are only a few men on deck they have efficient gear and winches and each man knows his job and sees it through.

The output of an American laborer is, say, twice that of a Japanese laborer. Assuming this is the case, why shouldn't 100 Americans operate a ship built with American ideas, of the same tonnage which would require 200 Japanese to operate? We certainly cannot hope to compete with a Japanese ship when a similar American ship is compelled by law to carry an equal number of men, each of whom is paid a salary twice as great as that paid a Japanese of similar rating.

By utilizing naval personnel in the merchant service a more experienced personnel would be gradually developed; the amount of graft in the merchant service would be decreased; the younger officers would have a higher average intelligence. It is by no means necessary for a merchant marine officer to be a college graduate, yet if more young men with liberal education enter the merchant marine it is sure to profit by the addition. Our ships, when in foreign ports, would be accorded more respect if officers and men from our regular navy were among the crew. Officers with naval training would as a rule be more conversant with international law, and would maintain better discipline. Naval officers would have to be broken in as regards the business end of the work, but it is believed that they would adjust themselves to the economics of the business, where this is the *raison d'être* rather than battle efficiency which is the case in the navy.

Navy personnel would take into the merchant service progressive ideas on navigation, radio telegraphy, and engineering. The navy system of sanitation and administration would supply certain points needed. On the other hand the navy would learn many points from the merchant service. Assuming that the beneficial features of operation and administration in each case would be adopted, both services would be certain to benefit by this teamwork.

An entirely possible development of the American merchant marine within the next decade will be thousands of Diesel motor ships of standard construction, manned by minimum crews, but supplied with labor saving machinery to replace the extra men, making runs similar to the efficient Great Lakes ships, and touching regularly at ports with modern terminals, and particularly South American ports. The entire foreign trade would then be centralized and made profitable by volume of trade, adequate terminal facilities, and by efficient administration, rather than by attempting to compete with foreign bottoms on the hit or miss basis of tramp trade.

It might still be necessary to make certain changes in the La Follette Act, but generally speaking, shipping will be made profitable by having markets so developed that full cargoes will be provided, and efficiently handled, making the pay of manning the ships a minor consideration. In this case there might for the time being be fewer jobs for the seafaring men, and for that reason, the change be resisted. But if the big view be taken, the labor unions will back the project, for in this way our merchant marine will be in a better position to compete with foreign bottoms, more American ships will be put in operation, and in the long run more and better paying jobs will be provided for seamen.

It will require men of particularly clear judgment to develop our shipping along these lines. The obvious first objection will be that if we run these ships there will be insufficient markets and exchange to make them pay. Here we get an excellent example from the United Fruit Line, which not only put on a line of ships but also made and developed their own markets. When the natives in the tropics failed to supply the demand in the United States for fresh tropical fruits, the United Fruit Line was not stumped; instead they bought plantations, built railroads, built their own docks, and produced tropical fruits, all with such success that they can put bananas and other tropical fruits on our breakfast tables at prices to compete with the apples grown in our own back yards.

Another objection to the big view by little men will be that we must take the conditions as we find them and not overshoot our mark. If it is correct in principle for America to keep on the seas an adequate and efficient merchant marine, then it is

submitted that we should not be content with the conditions as we find them, but rather that we should make the conditions that will react favorably to our merchant service. A large capital will be required to finance the merchant marine, but who will be better equipped for this than American financiers of the type of Mr. Schwab?

The word "subsidy" rubs the general public the wrong way, yet if it is conceded that some form of ship subsidy is necessary, then it can best be accomplished by giving the bonus another name. Taking a lesson from our brother legionaries, instead of giving our merchant marine a "bonus," why not give it "adjusted compensation"? Congress has hit upon the idea of having Naval Reserves serve in the merchant service, thus letting the navy foot part of the pay checks, and reducing the cost to the shipping concern by an equal amount. This should prove a helpful arrangement for both services provided the reserves in the merchant vessels keep up with their naval duties, and according to many persons of good judgment this can be done.

Another substitute for the ship subsidy plan is advanced by Mr. Edwin J. Clapp. "There are," he says, "potential American shipowners capable of so concentrating upon themselves the export traffic of the country that this concentration in itself would serve as a subsidy to offset their higher operating costs." The *Baltimore Sun* comments as follows on Mr. Clapp's plan: "The railroad's control of traffic gives its water line and water line extensions an advantage over any independent steamship company. Its overhead will be less than that of the independent company, because the existing agencies will take care of the water business. Every railroad agent will be a steamship agent as well. Solicitors for the rail traffic will solicit for the ship traffic. Shippers in the interior would rather deal with one transportation than two. It helps them in tracing delayed shipments and collecting claims. If the Chicago exporter can deal with one company in shipping goods to Buenos Aires he will be glad to do so, rather than to let one company handle them by rail to New York or Baltimore and another by water to the South American port. The advantages which the company will have in this respect, Mr. Clapp thinks, will compensate him for the higher costs necessitated by compliance with the American navigation laws.

"He enforces his argument by citing what the railroads have done with water lines in our coastwise traffic and, in particular, what the Canadian railways have done with their steamship lines on two oceans. Canada has conceived a national transportation policy, domestic and overseas. It would require only a slight advantage in load, a slightly heavier cargo to carry, to enable the American steamer to take the same unit rates as its foreign flag rivals, pay higher operating costs and yet make money."

Heretofore, the people of the inland states have taken little interest in the welfare or operation of our merchant marine, hardly seeing the vital relation of foreign shipping to their own prosperity through increased demands for their products. During the past decade, however, due to the war and to the publicity it gave our overseas shipping, or the lack of it, greater interest has been taken all along the line in our seaborne traffic, and to a less extent, this increased interest applies to the navy.

The farm bloc in Congress have come out in favor of a ship subsidy though condemning the practice on principle. The general public have become more interested in the efforts of our shipping interests to maintain the American flag on the sea. Chairman Lasker of the Shipping Board states that the recent cut in rates to South America made by the British Company, Lamport and Holt, can only be interpreted as "a declaration of war" in the South American trade. "The war," he says, "may be the forerunner of similar ones in other ocean passenger services in an effort to drive the American flag off the seas, but our 'hat is in the ring,' and we will stick as long as necessary to assure American domination of the passenger traffic on all oceans."

In order to get a correct estimate of intelligent public opinion, a series of questions were put to about a dozen prominent civilians and naval officers. A most obliging response to these questions shows that there is wide interest in the subject. The questions were:

(a) Is a government ship subsidy correct in principle?

(b) If so, what is the best form of subsidy?

(c) Do you consider the detail of line officers of the navy to duty in the merchant service as proposed in Congress a wise move?

(d) Would a line officer below the rank of lieutenant commander gain or lose professionally by two years' service in the merchant marine?

(e) Would the merchant service benefit by having in its employ personnel from the regular navy? (This refers both to active or reserve duty.)

There was a practically unanimous affirmative answer to (a). Mr. Irving S. Merrell makes the point that while a ship subsidy is correct in principle and necessary, the public is hardly ready to pass the necessary legislation, and that it will be necessary to enact laws giving a virtual subsidy without giving it that name. Mr. J. W. Powell writes, "A government ship subsidy for the United States is absolutely correct in principle. I am heartily in accord with the proposed Merchant Marine Act of 1922, although I should have preferred the use of discriminating duties and tonnage taxes in the indirect trade. This we could not get because of what seemed to both President Wilson and President Harding good diplomatic reasons, and the form that is now proposed should be effective in providing for the carrying of half of our commerce in our own ships. Close co-operation between the merchant marine and the navy is essential. One of the two principal reasons why we should have an American merchant marine is that it is an essential auxiliary to the navy in time of war. It can only operate effectively if the navy and the merchant marine are on excellent terms and this can only be achieved by association between the two services. Both the navy and the merchant marine would be the gainers by this association. As to the best way to work it out, there may be differences of opinion. Personally, I believe a naval reserve as part of the merchant marine comprising men who serve at stated intervals on board naval vessels, will accomplish the results in the most satisfactory way."

Most of the answers are doubtful and vague about question (b), the form the subsidy should take. As for (c) all but one answers in the negative; and almost all are opposed to (d), that line officers would gain professionally by two years' service in the merchant marine; and finally, practically all believe that the merchant marine would benefit by having in its employ personnel from the regular navy.

One rear admiral states, "I am inclined to think that it would

be to the interests of both the navy and the merchant marine if young officers could serve a certain length of time in the latter, provided this service should take place during the period they would otherwise have performed shore duty. This provision is necessary for two reasons: first, because it would be undesirable to decrease the amount of regular naval sea service; and second, because if they should do so, it would doubtless imperil their chances of promotion."

A captain gave the following logical answers: "In regard to (b), I think the subsidy should take the form of payment for speed, tonnage, and miles steamed, the principal factor being the miles steamed. Making this the principal factor would avoid paying a subsidy of any great amount to vessels idle in port and would in itself put a premium on speed. . . .

"With regard to sub-paragraph (d), if the navy is to be tied up or to do little cruising for one reason or another, the officer would gain professionally in seamanship and navigation by such employment. If the navy is to be active, I believe he would gain more by his regular duties in the navy."

One captain states, "(c) The service of line officers in the merchant marine ought to improve it; there would come about a better mutual understanding between the two services with a stronger sense of common interest; and a limited amount of such experience would benefit some line officers.

"(d) The right kind of officer would gain by added new experience. An officer who would lose would probably not profit much by any variety of experience. The Navy Department would have to see to it that merchant marine experience did not impair an officer's chances before the selection board."

One commander writing on (a), states, "The results of a strong merchant marine are twofold. The first is in the time of peace and may be called commercial. That is, instead of the American people paying out their own good money to foreigners for transportation charges they will pay it out to themselves. In this way one of the largest items in a nation's balance of trade, called 'invisible' items of the balance of trade, is created. This also is intimately connected with insurance, etc. This, therefore, is of tremendous importance to the economic health of the nation. Like the tariff, however, if the subsidy is too high, the

nation pays the price. The amount of the subsidy must be so nicely balanced that it is the result of natural economic factors, and herein lies all the dispute and arguments.

"The other result of a strong merchant marine is the effect it will have upon the resources of the country in time of war, in its relation to the navy, etc., with which most of us are familiar.

"A ship's subsidy is therefore correct in principle. Whether or not the principle is to be applied depends upon:

"(a) Economic conditions,

"(b) The nation's policies.

"(b) If applied, what is the best form of subsidy?

——"As proposed by President Harding to the present Congress. Also with the repeal of the obnoxious features of the La Follette Law."

The point most likely to be overlooked by the layman in his judgment of the navy and the merchant marine is the need of one for the other. The country needs both an adequate navy and an efficient and sufficient merchant marine; also each of these services needs the co-operation of the other. So far as the business management of the two is concerned, there should be an "interlocking directorship," the directors having equally at heart the interests of the navy and merchant marine.

An adequate navy is needed as an insurance against foreign aggression.

A sufficient and efficient merchant marine is needed:

(a) To provide a naval auxiliary is case of war,

(b) To provide a foreign market and the proper balance of trade during times of peace.

To procure an adequate navy, it is necessary for the taxpayer to pay the price, though this burden may be lessened to a small extent by combining the coast guard and the lighthouse service with the navy, resulting in reduced overhead costs; and also by having the navy work more closely with the merchant marine resulting in an indirect saving.

To insure the development of our merchant marine, the following steps are recommended:

(a) Permit our merchant marine to become centralized under big corporations, thus reducing overhead expenses, and increasing the chances of getting full cargoes.

(b) Permit and encourage railroad companies to own and operate steamship lines, as shipping agents and other railroad officials can work direct with the shipping concerns on the oceans.

(c) Change our laws so that they will permit the smallest possible crew rather than a large crew; and also give more protection to the ship operators in their relations with the crew. To obtain these changes in our laws, we must convince the labor people that it is to their own advantage to have our laws so made that our shipping can compete with foreign bottoms.

(d) Enact legislation which will provide a naval reserve operating on merchant ships, these reserves paid entirely or in part by the navy, and so adjusted that the wages paid by the shipping company will be about on a par with the wages paid to foreigners with similar ratings. This will provide at once a virtual ship subsidy and a naval reserve.

(e) Lastly, and only for the time and amount necessary, pay a ton-mile subsidy, the subsidy to be withdrawn as soon as our ships are able to meet all competition.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

OLD NAVIGATION

By Louis F. Middlebrook

There were many early scientists who tried to figure out and manufacture instruments for the use of mariners, but their difficulties were many, probably due to their inability to devise something that would overcome the unsteadiness of a rolling, pitching craft, in addition to the lack of educational qualifications of those who would use them. The compass was quite universally used, but all of the other early and ingenious devices made and employed to determine time and position may never entirely be known on account of the perils of the sea and the wholesale destruction of the ships containing them. The advent of the printer's art stimulated various writers on astronomy and navigation to advance their theories and offer practical means to support their ideas. An occasional treatise will come to the surface even nowadays, containing methods of semi-practical importance hitherto unknown or little recognized. These works now are, of course, curious antiquities, but nevertheless form parts of the progress which has resulted in the present exactness of the navigator's profession. Up to the beginning of the fifteenth century practically no instrument outside of the mariner's compass was being used to aid navigation. The Portuguese probably did more to improve the art about this time than any other nationality, by calculating tables of the sun's declination, and improving the astrolabe. The cross-staff or fore-staff was perhaps used for many years previous to,, and contemporaneous with, the astrolabe. The ascertaining of latitude seemed to be the limit of the mariner's ability and the mystery of finding longitude was unfathomable for many years after the Armada, or until the chronometer came to the rescue.

Concerning the mariner's compass, an ancient writer said: "This most useful instrument is justly ranked among the greatest wonders of the world, and deserves well to be understood by all practitioners in the art of navigation, for without the help thereof, it were impossible to trace out the unbeaten paths of the ocean for the procuring of trade and traffick beyond the seas to the remote parts of the world; whereby the glorious Gospel hath been transmitted into the most dark corners of the earth." Some historians attribute the invention of the compass to John or Flavia Goia, of Amalfi in Campania in the Kingdom of Naples, who used but eight points (four cardinal and four intercardinal) about the year 1300 and so left the improvements to posterity. Others concede the invention to the Chinese. Dr. Gilbert in his book, *De Magnette,* asserts that Paulus Venetus transported it first to Italy in the year 1260, having learned it from the Chinese. Mr. Barlow in his *Navigator's Supply* (1597) mentions personal conference with two East Indians who declared they used a magnetic needle of six inches or longer, upon a pin, in a dish of white China earth filled with water, in the bottom of which were two cross lines for the principal winds, the rest of the divisions being left to the skill of the pilots. The people of Bruges and Antwerp are credited with the perfection of the compass, and

OLD FIGURE OF MARINER'S COMPASS

also the British, by annexing twenty-four subordinate points, and also adding the 360 degrees.

The astrolabe was designed to take the altitude of the sun, moon, or stars, for calculating latitude, for determining the points of the compass, and time, and for ascertaining heights, but was not capable of precision. It was in use as early as the fifteenth century by navigators. It was probably in use by the Arabs many centuries before in the deserts and possibly on the sea. It was usually made of brass, bronze, or heavy wood of fine texture, and varied in size from two or three inches to a foot or more in diameter. The mariner's astrolabe was adapted from that of the astronomical instrument, by Martin Behaim, about 1480.

Columbus is said to have calculated his latitude by altitude of the sun taken with an astrolabe. Some of them are beautifully chased and engraved. The usual size employed by mariners was an instrument of three to seven inches in diameter and about one-quarter inch thick, of brass or copper, circular in form except at one place where there was a projection containing a hole for a ring by which it was suspended. A plumb line from the point of suspension marked the vertical line, from which were derived the horizontal line and center. The upper left quadrant was graduated to degrees. The pointer, of the same metal and thickness as the circular plate and about an inch wide and as long as the diameter of the plate, was pivoted to the center. A line was drawn across it its full length and at the ends of the line were fixed plates at right angles, each having a small hole, both exactly over the line, for sighting when suspended. It usually took three observers, one to hold the instrument, one to measure the altitude, and one to read off.

The sea-ring or "ring-dial," first produced during the early sixteenth century, was claimed to accomplish all that an astrolabe would do in finding the hour and the sun's altitude; and many similar contrivances are said to have been made and used nearly up to the time of the sea-quadrant (about 1600) and probably afterwards, until the Davis "hog-yoke" or sea-quadrant became quite universal. Up to this time all instruments in use at sea for measuring angles depended upon an unsteady plumb line or required the navigator or observer to look in two directions at once. The "ring-dial" consisted chiefly of two rings closely fitting within

From Boston Museum of Fine Arts

Astrolabe (Early Sixteenth Century)

each other, and a bridge. It was made either of brass or silver. The outermost ring represented the meridian and on the foreside had one of its upper quadrants divided into 90 degrees. On the back side a semi-circle was divided into a like number of degrees from the hole or center of the circumference. On the convex edge of this ring was fitted a sliding nut with a small wire ring in it for hand suspension. This nut had a small line engraved in the middle of it to coincide with and move to any of the degrees on the fore side. The inner ring (when opened to right angles to the outer ring) represented the equinoctial circle, on the inside of which was drawn a line, and thereon were divided the hours into halves and quarters, and numbered with the proper Roman numerals on the upper side of the ring. The bridge represented the axis of the earth, in the middle of which was cut a long slit. Upon one side of the slit were engraved the months (abbreviated) and on the other side the degrees of the sun's declination. In the slit was a sliding nut crossed with a fine line division. In the middle of this nut was drilled a small hole.

To find the hour of the day by this ring-dial, the hole in the small sliding nut on the bridge was placed to the day of the month (or sun's declination) and the nut on the convex side of the outer ring was set to the degree of the place's latitude (whether north or south) on the fore side of the outer ring. The rings were opened to right angles, and then, with the instrument suspended by the fingers, the upper end of the bridge was turned toward the elevated pole, and the flat side of the bridge turned against the sun, so that its rays might pierce the little hole. Then the instrument was turned to the sun until the sun beams—by the little hole—fell exactly upon a line drawn on the inside of the equinoctial or inner ring; then was shown the hour of the day according to the capacity of the instrument. The dividing of the degrees of the sun's declination on the bridge of this instrument is ascribed to Edward Wright who is said to have been the first to contrive this ring-dial, although Gemma is credited with having invented one in 1534.

To find the sun's altitude the line in the middle of the sliding nut was set on the outer ring, to zenith, or the beginning of the degrees on the fore side of the outer ring, then a pin was inserted into the center hole on the bridge, and the dial suspended on the

finger, and the edge of the outer ring turned toward the sun so that the shadow of the pin might fall upon the divisions on the back side. The degree cut by the shadow was the sun's altitude. The use of the instrument was discontinued before 1746.

The cross-staff, or fore-staff as it was sometimes termed, was an instrument consisting of box wood, pear wood, or bethabara,

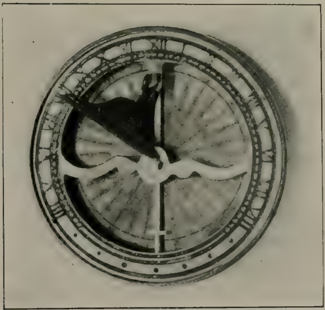
From Collection of L. F. Middlebrook

Sea-Ring or Ring-Dial, Circa 1600

From Colson's New Kalendar, 1746

CROSS-STAFF

about an inch square and a yard long. Degrees were graduated on the upper face. The cross was made to fit closely and to slide back and forth upon the staff at right angles. The cross was about twenty-six inches long, in each end of which were sights. Additional shorter crosses were also used. The use of the instrument was to take the meridian altitude of the sun or stars. It was generally discontinued before the time of the Davis quadrant.



From Collection of L. F. Middlebrook

ANCIENT TIME-PIECE (SUN-DIAL AND COMPASS), BRASS CASE SCREW COVER 2″ DIAMETER

Local time was roughly obtained before and after the time of watches, by means of the pocket sun-dial and compass. This handy little instrument was quite universally used both at sea and upon land and was about the only time-piece available pending the perfection of the watch and chronometer. The hour or sand glass was of course necessary; in fact, the hour glass was used on board ships of the British Navy as late as 1830.

The celebrated navigator John Davis produced his sea-quadrant or "hog-yoke" about 1594. This instrument was made of wood—mahogany, pear wood, or ebony, and sometimes teak with the arches made of box wood. Some were highly decorative and inlaid with ivory or pearl, while others were very plain and ordinary. It consisted of three vanes and two arches: the horizontal vane, which in observing was pointed to the horizon; the shade vane, so called because of its giving the shadow upon the horizon vane when observing; and the sight vane, which was placed at the eye of the observer and through which the shadow and horizon vane were seen. The smaller arch on the end of the instrument next the horizon vane was the "sixty" arch because it was graduated to 60 degrees, and the larger arch was called the "thirty" arch as it was marked for 30 degrees, this arch being divided into degrees and minutes. When observing, the shade vane was shipped upon the "sixty" arch always to an even degree, the arch being numbered from the upper end downward. The instrument was used to take the sun's meridian altitude. The horizon vane being shipped on the end, the shade vane on the "sixty" arch to a number of degrees less than the complement of the altitude by 15 to 20, the sight vane ready on the "thirty" arch—then, with the back to the sun, the sight vane placed to the eye, observation was made so as to cause the shadow of the upper edge of the shade vane to fall upon the upper part of the slit in the horizon vane, where there was a black line. If the horizon vane appeared through the slit, that was the sun's altitude, but if it did not appear, the sliding sight vane was shifted on the "thirty" arch until it did show. By adding the degrees of the "sixty" arch to the degrees and minutes thus found on the "thirty" arch, the sum was the complement of the meridian altitude. If the sun's meridian was south, and the declination north, the declination added to the zenith distance was the latitude north. The declina-

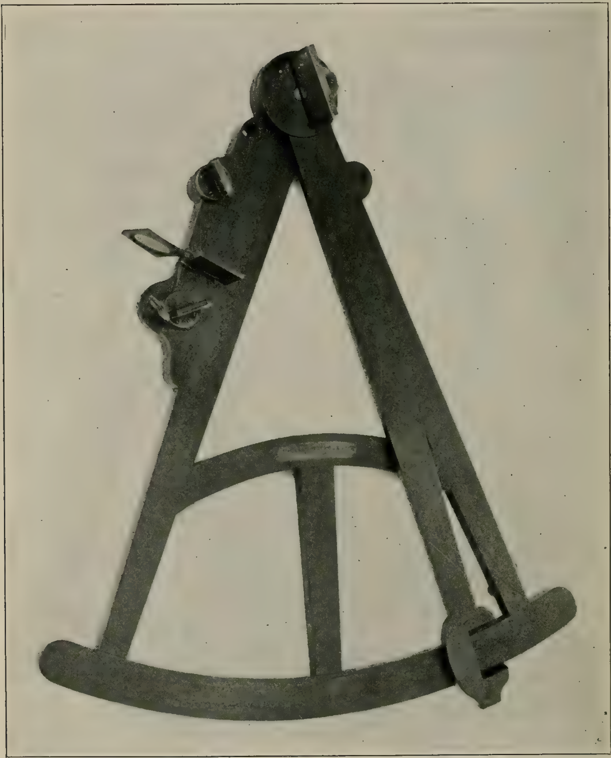
tions were already worked out and tabulated as well as the variations of declinations to every 15 degrees of longitude from the meridian of London in a handy "Kalendar" or nautical almanac. The Davis quadrant remained in common use until superseded in 1731 by John Hadley's quadrant, and Davis' instrument was used in many instances by those accustomed to it even as late as the Revolutionary War. Edward Wright devised a sea-quadrant about 1599 similar to the Davis quadrant, but it required two persons to use it, and was therefore not as popular or practical on an unsteady ship.

From Peabody Museum

Davis "Hog-Yoke" Quadrants

John Hadley probably made his first octant in the summer of 1730. It was tried out in 1732 by order of the Admiralty, found satisfactory, and was made and quite universally used by mariners

for many years, or until the sextant replaced it. The invention of the sextant is credited to Thomas Godfrey, of Philadelphia, in November, 1730. Clocks were probably invented about 1480 and watches about 1530; then it was that they were used for finding the difference in longitude between two places by comparison with local time. But they were inaccurate and not relied upon until about 1735, when the chronometer was developed to be an almost

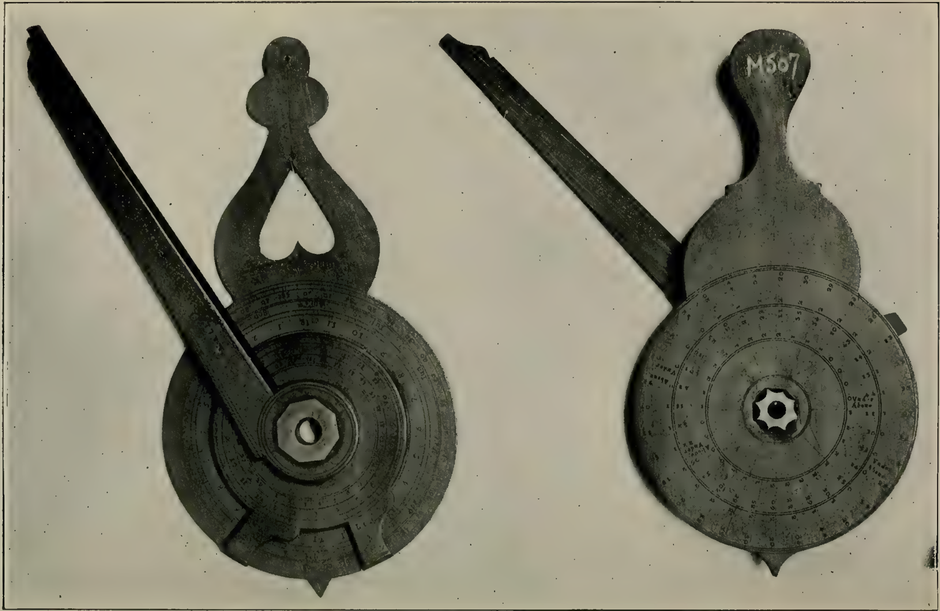


Owned by Mr. Morgan B. Brainard

Hadley Quadrant Inscribed "Mr. Isaac Seymour 1769"

perfect time-keeper. Thus John Hadley's octant, the chronometer, and the sextant, all invaluable instruments, were invented at nearly the same time.

The nocturnal was an auxiliary instrument (usually made of apple wood, pear wood, or box wood) for the purpose of telling time at night. It was in use, as records show, as late as 1750. It consisted of three parts. The largest or immovable portion, with a handle, had the outer circle divided into twelve months and subdivided into days; each division was marked with the names of the months. Some of them were more elaborate and contained another circle with the marks of the hours and still another circle graduated to 29½ parts or the days of the moon's age, by which the moon's southing might be known and thereby a computation made of the tides. There were three kinds of nocturnals. One made for the guard of the little bear, one for the guards of the great bear (or pointers), and one for both bears. If the nocturnal was made for the little bear, the twenty-first of April would be at the top. If made for the great bear, the seventeenth of February would be at the top. If made for both bears, there would be two indices on the inner or movable part. The back side of the largest or immovable part was divided into thirty-two points of the compass to show the bearing of the guards and thus indicate what declination the north star had upon any point of the compass. The inner, or movable part, if nocturnal was made for both bears, contained two circles and the indices, one marked "G" for great bear, and the other marked "L" for little bear. The outside circle was divided into 29½ days for the moon's age and the inside circle into twenty-four hours, graduated to quarters. The index belonging to the bear intended to be used was set to the day of the month in the outside immovable part, at pleasure. The third part was a long index or handle usually made of box wood, the edge of which was to be turned to the guards or pointers at the time of observation. To find the hour of the night and at what points of the compass the guards were, the index of the middle part was set to the day of the month, the instrument being held upright, then a sight was taken through the hole in the center, for the north star. When found the edge of the long index was turned to the guards or pointers when the edge of the handle

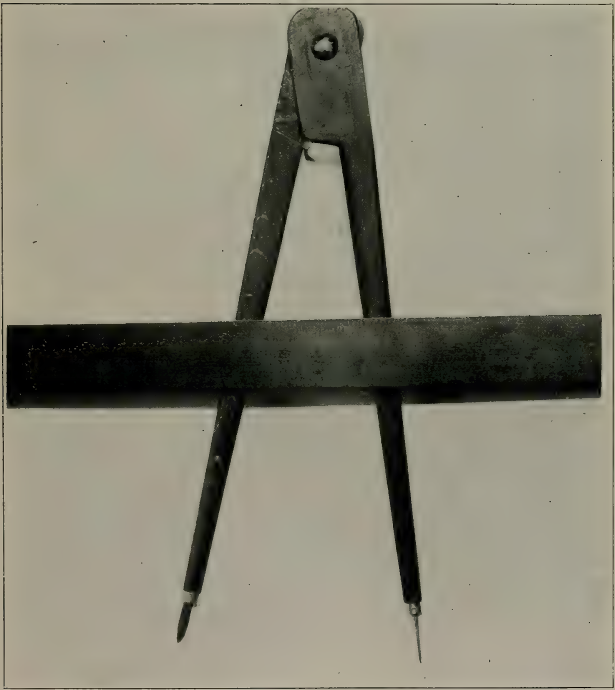


From Peabody Museum

NOCTURNALS

would give the hour on the outside edge of the inside circle. The invention of the nocturnal is credited to M. Coignet, in 1581.

Edmund Gunter, in 1624, supplied tables of sines and tangents applied to navigation, and invented the sector and the Gunter's scale—usually two feet long and about two inches wide and engraved with various lines and numbers. On one side appeared the cords, sines, tangents, rhumbs, etc., and on the other corresponding logarithmic numbers. Multiplication, division, and questions in navigation were solved by the aid of a pair of compasses on this scale. Perhaps it was the ancestor of the slide rule.



From Collection of L. F. Middlebrook

Section of the Gunter's Scale and Old Wooden Compasses, 1816

The log-chip is a device for finding the rate of the ship's speed. It commonly consists of a triangular piece of wood curved at the bottom and loaded so that it will float upright in the water. It has a radius of about six inches and is about one-quarter inch thick.

From Peabody Museum

TOP, CHIP-LOG AND LINE

LEFT TO RIGHT, 14-SECOND GLASS, EARLY NINETEENTH CENTURY; DEVICE FOR DETECTING SMALL PORTIONS OF TIME, 1830; LOG GLASS FROM C. S. A. SHIP "FLORIDA," 1864; OLD 28-SECOND GLASS

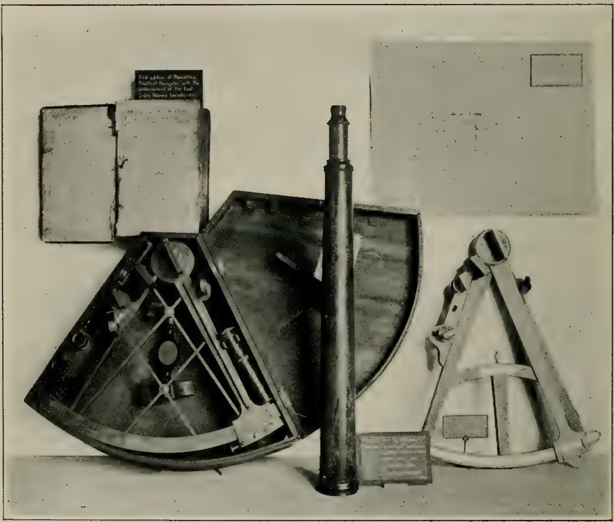
To the corners cords are attached connecting with the log line which is wound around a reel, the axis of which projects, allowing it to turn freely when held by the hands. The line is long enough to measure the distance sailed by the ship at her greatest speed during a given time, usually thirty seconds, and is divided into knots corresponding to a proportional part of the nautical mile, that is fifty-one feet; in some cases it is made a trifle longer or shorter. The string is knotted at such places that the spaces bear the same relation to a nautical mile of 6,070 feet (or 1/60th of a degree of latitude) that a half minute does to an hour—that is, the knots must be the 120th of a nautical mile apart. Each knot is therefore 50-75/120 feet. A certain length of line, not marked, intervenes between the chip and the first division of the line. This is called the "stray-line" and allows the chip to drift beyond the dead water to the wake of the ship. Each knot on the line is made sensible to the feeling as well as to the sight and is subdivided into ten fathoms, so-called. The time is measured by the small sand glass. In heaving the log the observer throws the chip over the taffrail and when the first mark on the line passes over the reel, he calls out "turn" to his assistant, who at once inverts the sand glass. When the sand has all run out, the assistant calls out "up," when the observer stops the running of the line, noting the knots and fathoms which have passed out. This done every hour, as well as the compass course steered, is entered in the ship's log to serve as a basis for the "dead-reckoning."

Ever since the beginning of the nineteenth century American navigators have quite generally followed the standard work of Nathaniel Bowditch as their "dictionary" in matters maritime.

Nathaniel Bowditch, the American author on navigation, was born in Salem, Mass., March 26, 1773, and died in Boston in March, 1838. He made his first voyage in 1795, as clerk, and later as supercargo; and in the course of five long voyages, rose to be master. Harvard conferred upon him the degree of M.A. and offered him a professorship of mathematics, which he declined, as he also did a similar offer from the University of Virginia and the United States Military Academy. He was admitted as a Fellow of the Royal Society of London. He produced his first edition of the *Practical Navigator* in 1801, which was printed in Newburyport, Mass., as were also other editions, and

Bowditch's Navigation, coupled with *Luce's Seamanship,* have practically formed the standards which have been established and authorized as the fixed rules and measures for American mariners.

The sextant shown with the Bowditch relics, is a universal reflecting instrument used for measuring angles on shipboard. It resembles the quadrant, but has an arc of 60 degrees. Ancient Arabian astronomers are said to have had a sextant of 59 feet 9 inches radius, about A. D. 995. Sextants are used to obtain altitudes of celestial objects in order to obtain latitude and local time, and longitude. It is an improved form of quadrant and is capable of measuring angles of 120 degrees. It consists of a frame, generally of metal, stiffened by cross braces and equipped with convenient handle. The arc is divided into double the number of degrees actually embraced between the two extreme



From Peabody Museum

THE NATHANIEL BOWDITCH RELICS

First Edition, 1801, *Practical Navigator*

His Sextant Spyglass Quadrant

graduations, as the fixed and movable glasses, owing to the double reflection, only form with each other an angle equal to one-half the angular distance between the two objects observed, one of which is seen directly, and the other by reflection from the index glass. In observations the sextant is held perpendicularly to the horizon. In taking noon sights at sea for latitude the observer takes his place shortly before noon, and turning down one of the colored glasses, to prevent the eye being injured by the glare, directs the sight tube to the sun, moving the index so as to bring the sun's reflected image to coincide with the sea horizon. As the sun rises he gradually advances the limb, clamping it, and using the tangent screw for this purpose as the sun's path becomes more nearly horizontal, and slightly rocking the instrument from side to side to insure that it is in a vertical plane at the moment the sun attains its greatest height. The reading on the limb at the moment the sun begins to dip is noted, and adding the declination derived from the nautical almanac to the true zenith distance obtained by observation, gives the latitude. Sights for local time are taken when the sun is rising or falling most rapidly. The calculations for this are more complicated. When ascertained, it is compared with Greenwich time, as shown by the ship's chronometers. The difference of time turned into arc at the rate of four minutes of time to one degree of arc, gives the longitude of the place.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DERIVATION OF MATHEMATICAL FORMULAE FOR VOLUME AND CENTER OF GRAVITY OF A PROJECTILE

By H. M. Brayton, M. E.*

One of the principal important features of the design of a projectile is the proper location of its center of gravity. Everyone at all familiar with ordnance design knows that unless the center of gravity of a shell or shot is correct it will not carry properly in flight and the whole law of exterior ballistics falls down.

It is therefore highly necessary that the projectile designer know how to calculate this point accurately. As far as the writer knows no simple relation has ever been worked out for the center of gravity of the ogive, that is the pointed part of the shell at the front of the section where the nose curvature starts. The ogive is formed by an arc of a circle in practically all shell. Some armor piercing shot have been designed with special curves like the cycloid. This discussion will deal only with the general shape formed by the rotation of half of the segment of a circle about the cord.

In order to obtain the center of gravity of an ogive it is also necessary to calculate the volume of the ogive. The calculation of the volume is also very necessary in shell design in order to predict the weight. The following calculations will deal only with the finding of the volume and center of gravity of the ogive part of the shell as the remainder of the projectile is of simple shape and the formulae for this part can be taken from any handbook or worked out readily by any draftsman.

*Formerly Chief Research Engineer, Frankford Arsenal, Philadelphia, Pa.; now Ordnance Research Engineer, Picatinny Arsenal, Dover, N. J.

Three methods of calculating the volume of an ogive will be given. The designer may choose the one which best fits his data or which he finds most convenient to apply. Two of the methods are without the use of the calculus, and the third uses calculus.

FIRST METHOD WITHOUT CALCULUS

The reader will now kindly refer to the sketch of Fig. 1. It is a well-known theorem enunciated by Pappus that the volume generated by an area rotated through 360 degrees about a line in the same plane but not cutting the area is equal to the area multiplied by the distance traversed by its center of gravity. If

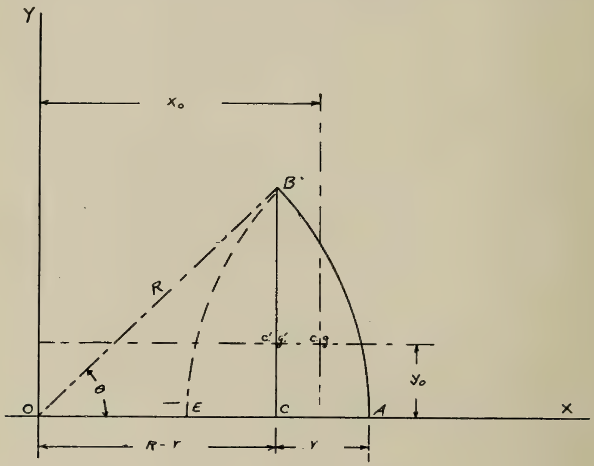


FIGURE 1

then in Fig. 1 we can find the center of gravity of the area A.B.C. which is half of the segment of a circle and also the area of this half segment we can calculate the volume formed by the complete rotation of this area about the line BC. This would form a shell ogive with radius of ogive of R and radius of shell r.

We shall now proceed to find the center of gravity of the circular half segment A.B.C. To do this we shall refer it to the regular X and Y axes as shown.

Let the center of gravity of half segment A.B.C. $=X_o Y_o$
Let the center of gravity of sector O.A.B. $=X_s Y_s$
Let the center of gravity of triangle O.B.C. $=X_a Y_a$
Let area of half segment A.B.C. $=A_o$
Let area of sector O.B.A. $=A_s$
Let area of triangle O.B.C. $=A_a$

We can take moments about both the X and Y axes of these three areas remembering that the moment of the entire area is equal to the moment of its parts thus,

$$A_s X_s = A_a X_a + A_o X_o$$

and

$$A_s Y_s = A_a Y_a + A_o Y_o$$

These two equations can be solved thus,

$$X_o = \frac{A_s\ X_s - A_a\ X_a}{A_o}$$

$$Y_o = \frac{A_s\ Y_s - A_a\ Y_a}{A_o}$$

We also know from the sketch in Fig. 1 that,

$$S = R\ \theta,\ A_s = \frac{R\ S}{2} \text{ therefore, } A_s = \frac{R^2\theta}{2}.$$

We also know,

$$\text{Cos. } \theta = \frac{O\ C}{R}, \text{ therefore } OC = R \cos.\ \theta.$$

$$\text{Sin.}\theta = \frac{B\ C}{R}, \text{ therefore } B.C. = R \sin.\ \theta.$$

and,

$$A_a = \frac{B\ C \times O\ C}{2} = \frac{R^2 \sin.\ \theta \cos.\ \theta}{2}.$$

$$A_o = A_s - A_a = \frac{R^2\ \theta}{2} - \frac{R^2 \sin.\theta \cos.\theta}{2}.$$

Therefore,

$$A_o = \frac{R^2}{2}\ (\theta - \sin.\ \theta \cos.\ \theta.)$$

From the triangle O.B.C. we know that,

$$X_a = \frac{2}{3}\,\text{O.C.} = \frac{2}{3}\,\text{R cos. }\theta.$$

$$Y_a = \frac{1}{3}\,\text{B.C.} = \frac{1}{3}\,\text{R sin. }\theta.$$

From the sector O.B.A. we know that,

$$X_s = \frac{2\ \text{R sin.}\theta}{3\ \theta}.$$

$$Y_s = \frac{2\ \text{R}\ (1-\cos.\ \theta)}{3\ \theta}$$

From the above data we may write,

$$X_o = \frac{\frac{R^2\,\theta}{2}\times\frac{2\ R\sin\theta}{3\ \theta} - \frac{R^2\sin\theta\cos\theta}{2}\times\frac{2\ R\cos\theta}{2}}{\frac{R^2}{2}\ (\theta-\sin\theta\cos\theta)}$$

$$Y_o = \frac{\frac{R^2}{2}\times\frac{2R\ (1-\cos\theta)}{3\ \theta} - \frac{R^2\sin\theta\cos\theta}{2}\times\frac{R\sin\theta}{3}}{\frac{R^2}{2}\ (\theta-\sin\theta\cos\theta)}$$

The two formulae for the co-ordinates of the center of gravity of the spherical half segment can be greatly simplified and come down to,

$$X_o = \frac{2\ R\sin^3\theta}{3\ (\theta\ \sin\theta\cos\theta)}. \qquad \text{(Eq. 1.)}$$

$$Y_o = \frac{R\ (2-3\cos\theta+\cos^3\theta)}{3\ (\theta-\sin\theta\cos\theta)}. \qquad \text{(Eq. 2.)}$$

From the sketch it is evident that,

$$\theta = \cos^{-1}\frac{R-r}{R} = \sin^{-1}\frac{\sqrt{2\ R\ r-r^2}}{R}$$

The co-ordinates of the center of gravity of the circular half segment are given by the formulae of equations 1 and 2. In our problem we are not interested in the value of Y_o but only in the

distance from the center of gravity to the line B.C. about which we must rotate the area to obtain the volume. This distance is,

$$X_0-(R-r)=X_0-R+r$$

The volume of the ogive formed by rotating through 360 degrees the area A.B.C. about the line B.C. is then,

$$V=A_0\ 2\pi\ (X_0-(R-r)).$$

Substituting known values,

$$V=\frac{R^2}{2}(\theta-\sin\theta\cos\theta)\ 2\pi\left(\frac{2\ R\sin^3\theta}{3\ (\theta-\sin\theta\cos\theta)}-(R-r)\right)$$

Simplifying,

$$V=\pi\ R^3\left(\frac{2\sin^3\theta}{3}-\cos\theta\ (\theta-\frac{\sin 2\ \theta}{2})\right)\quad \text{(Eq. 3.)}$$

Equation 3 will then give the mathematically exact volume of the ogive whose radius of shell is r inches and radius of ogive R inches. The volume is of course expressed in cubic inches when R and r are in inches. Should there be any occasion to use R and r in feet units the volume would, of course, be in cubic feet. The value of θ is, of course, expressed in radian measure. To convert from degrees to radians we merely multiply the angle in degrees by $\Pi/180$. The value of the angle θ is expressed as stated above by,

$$\theta=\cos^{-1}\frac{R-r}{R}.$$

It will thus be observed that this formula for volume of ogive involves only two variables R and r. θ can be procured from these two values also and from θ the values of $\sin\theta$ and $\sin 2\theta$ may be taken from any trig-table.

As a check on this formula for the volume of an ogive it is interesting to note the result when R and r are equal, that is, when the ogive becomes a hemisphere. If we substitute $R=r$ we have that $\theta = 90° = \Pi/2$ radians. Then $\cos\theta = O$ and $\theta = 1$. Substituting,

$$V=\pi\ R^3\left(\frac{2\times 1}{3}-0\right)=\frac{2\pi\ R^3}{3}$$

which, as is well known, is the volume of a hemisphere.

The formula given in equation 3 is very easy and accurate of application. Good accuracy can be obtained when the calculation after substitution is performed by a slide rule. This is because all of the terms come small for all practical values of R and r. If absolute accuracy is required the indicated multiplication and division must of necessity be done by hand.

SECOND METHOD WITHOUT CALCULUS

A second method of the volume determination of an ogive of a shell without calculus has been devised by Major J. H. Woodberry, Ordnance Department, U. S. A., at Frankford Arsenal as follows:

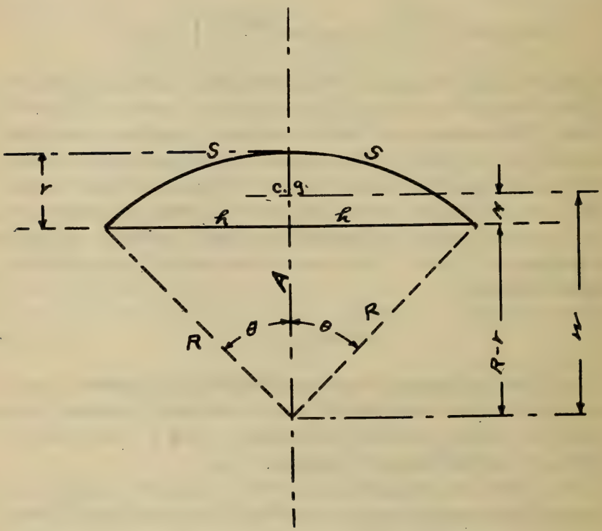


FIGURE 2

The reader should now refer to the sketch of Fig. 2. This sketch shows a complete segment of a circle the length of arc of which is 2S. The length of the cord is 2h. The radius of curvature is R and the height of segment r representing the radius of the shell.

We shall also bring in the theorem of Pappus as stated above in this derivation. If we draw from the extremities of this segment to the center of the circle, thus completing a sector, we have three regular figures—a triangle, a sector, and a segment. Then,

Area of sector $= A_s = R\ S$
Area of Triangle $= A_a = h\ A$
Area of Segment $= A_o = A_s - A_a = R\ S - h\ A.$

From any handbook we obtain the center of gravity of a circular segment to be a distance W from the center of the circle and,

$$W = \frac{(2\ h)^3}{12\ A_o} = \frac{2\ h^3}{3\ A_o} = \frac{2\ h^3}{3\ (R\ S - h\ A)}$$

Then $M = W - (R - r) = W - A$

Then by the theorem of Pappus the volume formed by the rotation of this area A_o about the cord is,

$V^1_o = 2\pi\ M\ A_o$

Substituting,

$$V^1_o = 2\pi \left(\frac{2h^3}{3\ (R\ S - h\ A)} - A \right) \quad (R\ S - h\ A)$$

simplifying,

$$V^1_o = \pi \left(\frac{4\ h^3}{3} - \frac{6\ A\ R\ S}{3} + \frac{6\ h\ A^2}{3} \right)$$

But this volume V^1_o is the total volume generated by the entire segment and the volume of the ogive would be just half of this. Hence the volume of the ogive V_o is given by,

$$V_o = \frac{V^1_o}{2} = \pi \left(\frac{2\ h^3}{3} - A\ R\ S + h\ A^2 \right) \quad \text{(Eq. 4)}$$

This formula for the volume of an ogive is mathematically exact but it involves S, h and A. All of these can readily be found, however, with only R and r known as follows,

$A = R - r$ (in inches).
$\theta = \cos^{-1} \frac{R - r}{R}$ (in radians).
$S = R\ \theta$ (in inches. θ must be in radians).
$h = \sqrt{R^2 - (R - r)^2} = \sqrt{2R\ r - r^2}.$

Although this formula is exact it is not nearly as accurate as the one given in equation 3 because unless one carries out all of the indicated multiplication and division by hand, a huge error will be present due to the fact that the terms in the brackets all come large, usually four-place numbers. These terms come nearly equal, that is, the difference will only be a two-place number, and as an ordinary slide rule is only accurate to two and three places, a large error can very easily be present. It is very tedious to calculate so much by hand and often the desired accuracy does not warrant this effort. The formula in equation 3 is much to be preferred for rapid work.

VOLUME OF OGIVE BY CALCULUS

Still a third formula for the volume of the ogive of a projectile may be obtained by the application of the calculus. The reader should now refer to the sketch of the front end of a shell shown in Fig. 3. Note the position of the origin of rectangular coordinates in relation to the projectile. The circle of the surface of the ogive is struck about the origin as a center. The equation of this circle referred to the exes X and Y is,

$$X^2+Y^2=R^2$$

or,

$$Y=\sqrt{R^2-X^2}$$

From the sketch,

$$Y_0=Y-(R-r)=\sqrt{R^2-X^2}-(R-r)$$

Now if we take an elementary slice through this ogive as shown on the sketch perpendicular to the axis of the shell and of thickness dX assuming the distance of this slice from the Y axis as X we can write the formula for the volume of this infinitesimal slice dV thus,

$$dV=\pi\, Y^2_0\, dX$$

Substituting the above value for Y_0 we have,

$$dV=\pi\left(\sqrt{R^2-X^2}-(R-r)\right)^2 dX$$

Integrating this equation between the base and point of the shell or between X=h and X=O we have,

$$V = \pi R^2 \int dX - \pi \int X^2 \, dX - 2\pi \, (R-r) \int \sqrt{R^2 - X^2} dX + \pi (R-r)^2 \int dX$$

$$V = \pi R^2 X - \frac{\pi X^3}{3} - 2\pi (R-r) \left(X\sqrt{R^2 - X^2} + R^2 \sin^{-1} \frac{X}{R}\right)$$

$$\left. + \pi (R-r)^2 X \right)\begin{matrix} X=h \\ X=O \end{matrix}$$

Substituting limits,

$$V = \pi R^2 h - \frac{\pi h^3}{3} - 2\pi (R-r) \quad (h\sqrt{R^2 - h^2} + R^2 \sin^{-1} \frac{h}{R}) + \pi (R-r)^2 h$$

(Eq. 5)

This formula while no more complicated than the others has the same objection as the formula given in equation 4 namely that no accuracy can be obtained with it by using a slide rule. The angle whose sine is $\frac{X}{R}$ must be expressed in radians. The value of h the height of the ogive is the same as given above or,

$$h = \sqrt{R^2 - (R-r)^2}$$

It is interesting to note in this formula as in the others the result when R = r = h and we have a hemisphere. As R — r is zero the two last terms are zero and the volume becomes $2/3\Pi R^3$.

THE CENTER OF GRAVITY OF THE SOLID OGIVE

If the reader will kindly be referred again to the sketch of Fig. 3, and the elementary slice of width dX, it will be apparent that

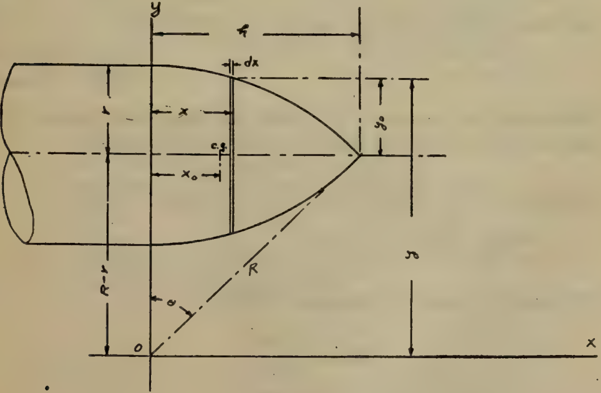


FIGURE 3

by means of the calculus we can obtain the location of the center of gravity of this mass. The center of gravity of a solid is expressed by the differential equation,

$$X_o = \frac{\int X\, dV}{\int dV}$$

where X_o is the distance from the base of the ogive to the center of gravity. The denominator of this fraction is the same as we have just calculated from the volume. Hence it is the volume and we do not have to calculate its value integrated again.

In the above discussion of the volume by calculus we showed that

$$dV = \pi\, Y^2{}_o\, dX$$

and that

$$Y_o = \sqrt{R^2 - X^2} - (R - r).$$

Hence,

$$\int X\, dV = \pi \int X \left(\sqrt{R^2 - X^2} - (R - r) \right)^2 dX$$

$$\int X\, dV = \pi\, R^2 \int X\, dX - \pi \int X^3\, dX - 2\pi\, (R - r) \int X \sqrt{R^2 - X^2}\, dX + \pi\, (R - r)^2 \int X\, dX$$

Integrating between X=h and X=O we have,

$$\int X\, dV = \frac{\pi\, R^2 X}{2} - \frac{\pi\, X^4}{4} - 2\pi\, (R - r) \left(\frac{1}{3} \sqrt{(R^2 - X^2)^3} + \frac{(R - r)^2 X^2}{2} \right)_{X=0}^{X=h}$$

Substituting the values of X between the specified limits and noting that the third term is not zero when X=O we have,

$$\int X\, dV = \frac{\pi\, R^2 h^2}{2} - \frac{\pi h^4}{4} + \frac{2\pi (R - r) \sqrt{(R^2 - h^2)^3}}{3} + \frac{\pi (R - r)^2 h^2}{2} - \frac{2\pi (R - r) R^3}{3}$$

The center of gravity of the ogive is then,

$$X_o = \frac{\int X\, dV}{\int dV}$$

or,

$$X_o = \frac{\frac{R^2h^2}{2} - \frac{h^4}{4} + \frac{2\,(R-r)\sqrt{(R^2-h^2)^3}}{3} + \frac{(R-r)^2h^2}{2} - \frac{2(R-r)R^3}{3}}{R^2h - \frac{h^3}{3} - 2\,(R-r)\,(h\sqrt{R^2-h^2} + R^2\sin^{-1}\frac{h}{R}) + (R-r)^2h} \qquad \text{(Eq. 6)}$$

Unfortunately this formula can not be solved with a slide rule with the proper degree of accuracy. The value of h in terms of R and r can be substituted if desired but it is the writer's belief that it is better to solve first for h and then substitute its value in the above formula for the center of gravity.

It is interesting to note as a check on this formula that when $R = r = h$ and we have a hemisphere we obtain,

$$X_o = \frac{\frac{R^4}{2} - \frac{R^4}{4}}{R^3 - \frac{R^3}{3}} = \tfrac{3}{8}\,R$$

which is the distance of the center of gravity of a hemisphere from its base.

CENTER OF GRAVITY OF ENTIRE SHELL

Thus far we have discussed only the method of finding the volume and center of gravity of a solid ogive. Most ogives are of course not solid but contain a cavity usually formed by a radius about the same center as the outside. This is illustrated in Fig. 4. If the center of gravity of the actual ogive is required as is

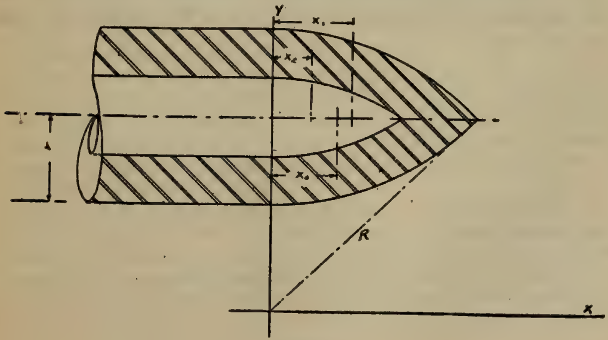


FIGURE 4

usually the case we must apply the formula given in equation 6 twice, once to the entire solid ogive, and again to the hole as if it were solid. Assume the center of gravity of the solid shell ogive at a distance of X_1, and that of the hole if it were solid at X_2, then by taking moments about the base line we can get the distance of the center of gravity of the actual hollow ogive from,

$$V_o X_o = V_1X_1 - V_2X_2$$

therefore,

$$X_o = \frac{V_1X_1 - V_2X_2}{V_o} \qquad \text{(Eq. 7)}$$

The center of gravity of the rest of the shell can be obtained usually merely by inspection, and then the center of gravity of the hollow shell as a whole can be obtained from the general formula,

$$X = \frac{V_1X_1 + V_2X_2 + V_3X_3 \text{ etc.}}{V}$$

or,

$$X = \frac{\Sigma\, V\, X}{V}$$

Plus is used in the above formula if the volume is a solid mass and minus if a hole.

The ogives of most shell especially of the larger caliber are formed by forging or nosing-in as it is called. Before the nosing-in dies can be made a lay-out must be made on the drawing board to determine where the metal will flow to, and what the interior radius will be when the shell is finished. The formulae given in this article for the volume of an ogive can be conveniently used in this work.

DISCUSSION

Employment and Tactics of Aircraft in Naval Warfare

(See Whole No. 234, Page 1263)

Captain W. T. Cluverius.—Commander Jackson's comprehensive paper is a timely contribution to the much needed inter-service education in this new and vital agency of warfare.

In the expression of opinion by those of the service afloat there is danger incurred both in magnifying and in underrating the rôle of aircraft in naval operations.

If too much is claimed then the future of the capital ship is jeopardized and all effort is likely to be directed toward the upbuilding of an air force and of little else. No naval officer has yet expressed a professional belief that the experience of the World War or the test attacks subsequently conducted by aircraft against ships as targets have sounded the knell of the battleship and that it has been supplanted by the plane.

Similarly, if the value of aircraft is underestimated there are two risks involved. One, that no further development of this energy which has been proved to be essential will obtain; the other, that no modification in fittings or design will enter into future battleship construction wherewith to combat the employment of aircraft by the enemy.

The author of the paper in question is believed to be entirely correct in holding the opinion that the airplane is a most important adjunct of the Fleet. But the adjunct it must remain and perform always auxiliary functions.

These may be summarized in (a) the service of security and information and (b) the employment in fire control.

Both of the foregoing necessarily entail the supremacy of the air for execution and indicate most extensive employment of scout, patrol, and fighting types together with their carriers—units of the Fleet.

Bombing planes, carrying heavy charges of explosives, are tied to shore bases for operation. Our fleet actions will not be fought alongshore. The consideration of this function of the airplane is, therefore, not primarily a naval one except insofar as it pertains to defense against bombing in overseas expeditions. This activity is inclusive with the control of the air previously referred to.

We must accept the air force as a factor of a fleet and it must at all times be reckoned with. Certainly the battleship may undergo many changes in armament and maneuver in order to neutralize the hostile employment of aircraft and maintain its own effectiveness. As surely, also, that nation which fails to include in its naval establishment an air force

capable of accomplishing the outlined functions will face defeat at the hands of the nation that does do so.

In the most recent example of international conflict, the chief rôle of the navies of the maritime powers at war was safeguarding the transportation to and maintaining in the theater of land operations the troops engaged.

No matter what agency was employed in so doing, the surface of the sea was the reference of all activities. Submarines and airplanes contributing to the success of such movements were concerned alike with what went on upon the surface, that is, with the transport. In the transport was located the soldier whose presence at the scene of action was eventually to influence the outcome of the war. All else was incidental, no matter how important.

Assuredly the reference will continue to be the surface of the sea until something else can supplant the transport—a surface ship—in the carriage of the vital cargo. If that something else comes to be a huge plane capable of transporting ten to twelve thousand troops in one passage with lightning-like rapidity through the air, then the reference of all that is essential to the Navy's share of hostilities does shift to the air. The air force immediately becomes the paramount issue: *it* is the Fleet.

Then, and only then, is the battleship doomed.

To the most ardent progressive in the Navy and to the most advertised propagandist in the Army I put the question:

Will *we* see this come to pass?

I ask you.

Membership Life, regular and associate, 4821.
New members, 7. Resignations 1. Deaths, 2: Lieutenant Commander F. J. Haake, U. S. Coast Guard, Mr. Park Benjamin.

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INFORMATION INDEX

PROFESSIONAL NOTES

PREPARED BY

Lieutenant Commander F. W. Rockwell, U. S. Navy

and

Lieutenant Commander J. B. Heffernan, U. S. Navy

GENERAL ARRANGEMENT

GREAT BRITAIN

British Naval Power.—It is a matter for satisfaction that the Government, after pressure from the naval Members of the House of Commons, have agreed to send the Battle Cruiser Squadron of the Atlantic Fleet to Rio de Janeiro for the centenary of Brazilian independence. There has not been a representative armored squadron sent abroad since the war, and to have omitted to send one in reply to such an important invitation as that from Brazil would have been tantamount to an admission that we have relinquished our position not only as first naval Power, but as one of the leading sea Powers. Among other occasions of late years when squadrons have gone abroad mention may be made of the visit to the United States in 1905 of the late Marquis of Milford Haven, in command of the Second Cruiser Squadron. In 1908 Rear-Admiral Sir Percy Scott took a similar squadron to South Africa during the convention which brought about the union of the States there, and subsequently crossed with the squadron to South American ports. As Sir Percy himself says in his memoirs, after describing this visit, "showing the flag occasionally in a splendid fighting squadron like this is in fact more effective than when it is seen every day in a small craft of no fighting value." In the following year the Hudson-Fulton celebrations in America led to an international gathering of warships at New York, at which this country was represented by a cruiser squadron headed by the *Inflexible,* then new, flying the Union flag of Admiral of the Fleet Sir Edward Seymour. Since then, however, the White Ensign has not been flown under peace conditions by armored ships of corresponding importance on the other side of the Atlantic.

Although in point of numbers the British vessels at Rio will not equal those of America and Japan, yet in the *Hood* we have a ship which represents the last word in completed capital ships of post-Jutland design. Not only is the *Hood* now the largest man-of-war in the world, with a

displacement of 41,200 tons, as compared with the 32,600 tons of the American *Maryland*, but as long as the Washington Treaty is adhered to she must remain so, for the latter imposes a tonnage limit of 35,000. The American vessel, however, has a somewhat heavier armament of eight 16 in. and fourteen 5.5 in. guns, as compared with the eight 15 in. and twelve 5.5 in. guns on the *Hood*, and she is, moreover, much better protected. It is an interesting fact that of the 14 ships mentioned as likely to be present at Rio, apart from those of Brazil herself, no less than seven have been built in this country. America is sending the *Maryland, Nevada, Arkansas* or *Utah*, battleships, of which the last-named is at present in European waters as flagship of the Vice-Admiral Commanding. Japan will be represented by the battleships *Idzumo* and *Iwate* and the cruiser *Asama*, all of which were built at Elswick, being launched in 1900, 1899 and 1898 respectively. Argentina will send the *Moreno* or *Rivadavia*, both American-built battleships, while Chile will send the *Almirante Latorre*, the Armstrong battleship which served in the war as the *Canada*, being present at Jutland. Portugal will contribute either the *Republica*, cruiser, or the *Carvalho Aronja*, sloop, the latter being originally the British *Jonquil*. There is certainly some satisfaction to be gained from the fact that British warship constructors will be so largely represented in such a gathering. That Japan should be content to send such old vessels is rather surprising, for it makes the representation of the three leading sea Powers nothing like the ratio of 5-5-3 for Britain, America and Japan adopted at the Washington Conference.

From the standpoint of our naval *personnel*, such cruises as that which Rear-Admiral Sir Walter Cowan is to make are very valuable, for, as the Americans discovered long before the war, they afford opportunities for giving ships' companies on the home station a sight of foreign ports, thereby increasing the attractiveness of the Navy to recruits. If it were not for the expense it would be good policy to have such cruises periodically, but as things are the Admiralty cannot take it upon themselves to add this extra cost to the Navy Estimates. Yet, on the other hand, it is a question whether the country would not gain in the long run, for it is a well-known axiom that trade follows the flag. France has recognized this in deciding to send a flying squadron, composed of the *Victor Hugo*, and *Jules Ferry*, under Rear-Admiral Gilly, on a nine months' cruise to the Far East to push French trade.—*Army, Navy, and Air Force Gazette*, 5 August, 1922.

OFFICIAL VIEWS OF SERVICE AFFAIRS.—

Naval Air Pilots

Captain Guest (to Viscount Curzon): "Pilots working with the Royal Navy are interchangeable with those working on other duties, as it is considered necessary to give them the widest possible experience. A certain amount of special practice work is needed in connection with co-operation with the Fleet, and pilots so engaged are, as far as possible retained in their appointments for a period of four years; though in practice, on account of promotion, or owing to their being required for special appointment, or for some other similar reason, the full period is not always served by all officers. Changes between pilots working with the Royal Navy and those working with the Royal Air Force in other areas have been made. Two pilots borne in H. M. S. *Argus* have been changed during the current year. One of these was required for a course at the Royal Air Force Staff College, and the other for experimental work."

Air Force Reserve

Captain Guest, (to Viscount Curzon): "The statements which have appeared in the Press recently to the effect that a new Air Force Reserve

was being created are not quite accurate. The position is that officers who were granted short service commissions in 1919 for a period of three years' service on the active list, followed by a period in the reserve, will commence to pass into the reserve this year. The first officers will be transferred in September. The reserve is intended to provide for the requirements of the air force at a time of national emergency, including the duties of the air force in connection with the Royal Navy. A number of the pilots who are at present serving on short service commissions, and who will in due course pass into the reserve, are fully trained and experienced in naval work. The reserve also includes observers. It is considered that the annual training provided for under the scheme will be sufficient to keep pilots and observers in training to carry out any air force duties which they may be called upon to perform, including duties in the squadrons of the Royal Air Force attached to the Royal Navy."

Air Force Research

Captain Guest (to Lieutenant-Colonel More-Brabazon): "No new barracks are being constructed for the Royal Air Force in the Isle of Grain. I know of no naval barracks in the near neighborhood except at Sheerness, which is situated on the other side of the Medway to Grain. The river at this point is more than a mile wide and it would, therefore, not be economical to accommodate Royal Air Force *personnel* on that side of the river. The total provision made in the Air Estimates for carrying out research work is £1,147,000. This figure represents the sum which is devoted to all forms of experimental and research work carried out under the direction of the Air Ministry, and into this work enters a very substantial element of pure research, the cost of which it is not possible to extricate from the remainder of the vote. It also includes a sum of £47,000, which is specifically confined to pure research work carried out at the National Physical Laboratory, at the Air Ministry Laboratory, and by the Aeronautical Research Committee, the Ordnance Committee and Research Department at Woolwich, and other joint establishments, and also by special consultants."—*Army, Navy, and Air Force Gazette,* 5 August, 1922.

ADMIRALTY ACCOUNT OF TORPEDO AEROPLANE ATTACK ON FLEET.—In view of the unauthorized and inaccurate reports which have appeared in the Press with regard to the torpedo aeroplane attack on the Atlantic Fleet, which took place off the Isle of Wight on July 7, in the presence of H.M. the King, the Admiralty consider it desirable to issue the following brief statement of the facts:

The exercise was in no sense novel, and was designed as a spectacle rather than as a critical experiment. Similar exercises have been carried out on several occasions during the past three years, and the results on July 7, only confirmed previous experience.

In order to afford practice to the torpedo aeroplanes, the Fleet approached to within a few miles of the aircraft base in broad daylight at low speed on a pre-arranged day, and at an hour signalled in advance to the aircraft. There was, therefore, no surprise attack, and the conditions were essentially unwarlike and unreal.

Moreover, as is unavoidable in all peace exercises, the Fleet offered an unresisting target to the aircraft, whose attack was undisturbed by any counter-offensive action, whether by the interference of Fleet aircraft gunfire from the light-cruiser and destroyer screens, or heavy, medium, and anti-aircraft gunfire—combined with splash barrages—from ships in the battle line.

The aircraft were thus allowed to develop to the full their offensive, while the Fleet was debarred from defending itself in any way. In spite of these favorable conditions, the number of hits obtained on the battle-line was small and of minor tactical importance.

Throughout the operation the pilots of the attacking aircraft showed skill and dash in the handling of their machines, but, as already indicated, the conditions were so unreal that no practical lessons affecting the security of the Fleet can properly be deduced from these exercises.—*Naval and Military Record,* 26 July, 1922.

AERIAL TROOP TRANSPORT.—An improved aerial troop transport, with a hull of tubular steel large enough to accommodate twenty-five soldiers and their equipment, has been ordered by the Air Ministry under the recently announced £2,000,000 expansion scheme to provide 500 machines for home defense.

Other orders call for planes constructed entirely of metal, weighing fifteen tons each; big multi-engined bombers and single-seated metal fighters of great speed.—*Boston Evening Transcript,* 29 August, 1922.

AEROPLANES FOR NAVY.—There are 127 service aeroplanes in active commission engaged in exercises with the Navy, and a total of 359 aeroplanes for all purposes connected with the Navy.

These facts were announced by Captain Guest (Secretary for Air) in reply to questions in the House of Commons yesterday week.

The Minister was asked by Viscount Curzon whether any of the machines working from or with H.M.S. *Argus* had recently crashed, and how many aeroplanes were available for service working with the Royal Navy on July 16, for bombing, fighting, torpedo carrying, observation, and training respectively.

Captain Guest replied that since May 15 last only two aeroplanes had been seriously damaged and written off during deck practice. Damage to aeroplanes was to be expected in training exercises of this kind, but this did not affect the number of aeroplanes available, damaged machines being at once replaced from the supply held in immediate reserve.

Aeroplanes were available in the following numbers, including the 50 per cent first line reserve, which was kept at the unit and provided immediate replacements for any damaged or unserviceable aeroplanes:

Reconnaissance—18 ship planes, 18 float planes, 15 flying boats.
Spotting—18 ship planes.
Torpedo carrying—18 ship planes.
Fighting—9 ship fighters.
Training—9 float seaplanes, 12 flying boats.
Development—6 flying boats, 4 torpedo ship planes.

Thus there were 127 service aeroplanes in active commission and first line reserve engaged in aerial and naval peace exercises or in naval air training and development. In addition, two of the reserve squadrons, comprising 36 aeroplanes, including immediate reserve, were inter alia being used for certain other special forms of naval co-operation.

Finally there was maintained behind these units a main reserve of the various types amounting to over 200 aeroplanes without pilots, all of which would be available for the reinforcement of the above naval units.

The actual grand total of aeroplanes for all purposes connected with the Navy was 359, exclusive of the two reserve squadrons.—*Naval and Military Record*, 26 July, 1922.

FUTURE OF THE DOCKYARDS.—The reduction of the Royal dockyards is now approaching completion, according to an official statement, and it is expected that discharges will soon cease. This is good news for the localities concerned, which have suffered severely during the past three years. At the same time disturbing rumors as to the fate of Sheerness have been set at rest by the assurance that there is no intention of closing down that establishment. It remains to be seen, however, whether the reductions effected to date will satisfy the economists, who have been

urging a more drastic process of demobilization. Pembroke has escaped suppression only because of the abnormal state of unemployment in the country, and a return to better conditions may be followed by the closing of the Welsh yard, which the Admiralty do not consider to be essential to future requirements.

With the fate of Pembroke still undecided it is particularly unfortunate that work recently executed there should have shown such a large excess of cost over the original estimate. The country has had to pay £180,000 more than the estimated price for completing three vessels, only one of which is a fighting ship, and this loss, so the Admiralty declare, must be attributed mainly to inadequate output of work by the Pembroke staff. If there are many other instances of this kind, Parliament will certainly demand a review of the whole question of dockyard maintenance. The future of Woolwich Arsenal is also receiving attention, and in our last issue we gave particulars of a scheme which has been under consideration for some time past. It is to be hoped, however, that no further experiments in State competition with private industry will be sanctioned after the egregious failure of the locomotive building project. Moreover, apart from questions of economy, the further development of Woolwich as a war arsenal is open to grave objection on strategical grounds because of its exposure to air attack. The proposal to create a new State arsenal at Gretna has been dropped for reasons of economy, and also because of the opposition it encountered from Labor interests. Nevertheless, the fact must be faced that Woolwich has become a most unsuitable locality for a great national arm depôt, and that money spent on developing it in this respect will be money wasted.

This problem of readjusting Government dockyards and arsenals to peace requirements is not confined to Great Britain. It is proving exceptionally difficult across the Channel, where the dockyard interests command a great deal of political power and have contrived so far to evade retrenchment on anything like the scale which it has reached here. When the size of the respective fleets is taken into consideration it will be found that the French marine budget is burdened far more heavily than our own by expenditure on shore establishments. Competent authorities estimate that the French dockyard personnel could be reduced by one-half without in any way prejudicing naval efficiency. Apparently, however, the Government considers it impolite to attempt any such sweeping cut.

The same question came up in the United States last month during the debate on the Naval Appropriation Bill, when a resolution was tabled urging the appointment of a committee to investigate the possibility of abolishing useless navy yards and stations. Senator King said that these now numbered four hundred, of which one hundred and fifty might be done away with at no loss of efficiency. It certainly seems an extraordinary total, even when the great extent of coastline is remembered. On the whole, we probably pay less for dockyard administration in proportion to our naval power than any other country in the world.—*Naval and Military Record,* 26 July, 1922.

FRANCE

FORTHCOMING MANEUVERS: REVISED CHARACTERISTICS OF THE NEW SHIPS.—The Salaun fleet, comprising the 24,000-ton *Bretague, France,* and *Paris,* the 4,500-ton and 27-knot *Strasbourg* (Admiral de Caqueray), *Metz,* and *Mulhouse,* and eight large destroyers, will be this week off the Brittany coast for the purpose of carrying out combined maneuvers, on new lines, with the Northern Squadron (Admiral Lequerré) and defensive organizations, thus reversing pre-war conditions, when the rule was for the Brest division to join the Medeterranean Fleet for yearly "grandes

manœuvres navales," which points to a vast change in the naval strategy of France. Formerly, fleet action was the sole aim and end of maneuvers; to-day, action is being divided into aerial and submarine attacks, mining ambushes, long-range bombardment, camouflage and decoying practice—a more varied and interesting program.

The plans of the ships ordered this year have all been revised and improved and, in some cases, full designs will not be completed for a few months to come. The 8,000-ton cruisers will mount eight guns of 6.2 inches (155 mil., a new caliber superior in range to the 194 mil. now in service) in thick armored turrets. In the matter of all-round defensive qualities, against either gun or submarine explosions, it is considered no rival cruisers can compare with these new *Duguay-Trouins,* that will be faster at sea than all other ships of superior or equal gun power. They will develop 30,000 h.p., more than the fine British *Hawkins.* Similarly, the 2,500-ton *Jaguars* will carry six long caliber 4.7-inch guns (120 mil. tested in the course of the war, and twice as powerful as the 4-in. guns in service). Compared with the remarkable ex-Boche *Amiral Sénès,* they will be about equal in range, better armed end-on, and will possess superior defensive qualities more stability, more fire endurance and higher speed at sea. They will easily outclass the fine Italian scouts of the *Leone* and *Aquila* classes, of smaller size and inferior robustness. The 12 destroyers of the *Cyclône* series will have a normal displacement of 1,425 tons, and be armed with four 4.7-inch weapons and two 16-pounders.

Strange to note, the fine 8,000-ton cruisers meet with some opposition in the service. They will cost an enormous sum (75 million francs), that would be better employed, it is contended, in submarines and bombardment avions. The construction of these cruisers to spread over several years is held to have for *raison d'être* the wish to give nominal employment to the 30,000 Bolshevist workmen of the State arsenals that will long continue to be a millstone round the neck of the Marine Francaise. In the Senate, as well as in the Chamber, a strong movement is on foot to urge the discarding of large cruisers and, instead, the wholesale manufacture of aerial and submarine mosquito weapons, that can be made ready in a few months' time and are adapted to France's geographical needs, as well as to the requirements of the actual political situation.

Moreover, attention has been called to a signficant move by the Italian Admiralty that is revealing itself as a thoroughly efficient and go-ahead body, free from those many red-tape letters that paralyze Rue Royale. For the two 8,000-ton cruisers of the 1922 program the Italian Marine Minister wants to substitute four destroyers, six submarines, and 70 seaplanes, of which 10 are to be heavy bombardment machines. From M. Raiberti's recent letter to the Mayor of St. Nazaire it looks as if the French Navy would need to change her methods before being in a position to outdo Italian yards and factories.

Strenuous war training is going on in the North under Rear-Admiral Lequerrè, who is proving himself an energetic man of action, ever at sea, studying the various aspects of the problem of coastal defense. It is expected the appointment of the active Admiral Barthes in command of the Channel front will have for effect to give new life to Channel mimic warfare, as the shore fixed and mobile gun batteries, together with coastal aerial squadrons, will join in the fray more than they have done hitherto. Yet, it will be agreed that Dunkirk, where Admiral Barthes has his headquarters, is hardly the right place from which to exercise the effective command of the Brittany and Normandy coast, the same as Dover in England must be said to be geographically ill-adapted to look after the naval interests of Cornwall and Devonshire. So, in practice, M. Barthes will simply have, as effective duties, to superintend defensive preparations in Pas-de-Calais and Flanders. He will do at leisure what

the gallant Admiral Ronarch did under the pressure of war. Moreover, the naval and mercantile revival in Bocheland, the creation on Dutch territory of German seaplane factories, together with the defensive alliance with Belgium, are bound to confer additional importance on the Dunkirk strategic point *d'appui.*

It is also amusing to note, in these times of economy and retirement talk, that the sole result, up to now, of the Guist'hau Coastal Defence Scheme has been to add to the number of ports-militares. Dunkirk, Marseilles, Algiers, where Commanders-in-Chief Barthes, Ames, and Varney are to officially reside become de factor ports-militaires each counting two flag officers, captains, and army colonels and their numerous staffs of attached officers and red-tape employés. There will naturally be important batteries of naval guns and super-cannon, with the necessary scouting and bombardment seaplanes, and as coastal defences without sea-going craft would be like an army without infantry, there must be ships, and ships in adequate number, attached to those new bases, which represent a good lot of matériel and personnel, and no small increment of the naval expenditure.—J. B. Goutreau, in *The Naval and Military Record,* 26 July, 1922.

Command of the Water: Combined Maneuvers off Brittany: French Opinion Concerning the Washington Naval Limitations.—The word "revolution" has often been used in relation to naval warfare, but never more truly than at the present moment, when in all great navies experiments are being made with new weapons and tactical devices claimed to throw into obsolescence all armaments now existing. These changes, now in the making, are the twofold result not only of war teachings but also, and chiefly, of post-war aerial and scientific progress generally, with the consequence that the former criteria of relative naval strength are becoming worthless, as are also former methods of training for war. Speed and range are the determining factors that govern tactics and armaments, and it is a sad fact that the mighty but cumbrous and slow line of battleship is being left behind, if not aside, and that to-day the best brains in the world in Germany especially, are being centered on producing the largest and swiftest aerial fighting machine. Thus to-day Admiralty experts are vying with our reputed constructors, Brequet, Bleriot, Farman, in bringing to life the most powerful "hydravion de bombardement." and no wonder. In a certain sense, the bombing quadruplane (1,100 h.p.), and the 1,800 and 2,500 h.p. naval biplanes now undergoing tests at St. Raphael and elsewhere are more important to France than the splendid 8,000 ton cruisers just ordered. The latter represent the hope of to-morrow—three years hence—whereas the former are the certainty of to-day, it being easy to multiply their number in a few weeks' time and to throw them against any aggressor, with trained crews and their complement of bombs on board.

Even in Admiralty circles the number is fast growing of experts who see, in the large armored bombing and torpedo plane, the only reliable instrument of the command of the water in European seas and who genuinely believe that, by multiplying such weapons in the naval stations that border the North Sea, Channel, Atlantic, and Mediterranean, France has in her hands the means of more than retrieving economically and promptly, the naval rank which she lost through sacrificing her navy to the Allied cause in the course of the Great War.

Although fleet action is being prepared for in the good old style, and the sinking of the *Prinz-Eugen* by the *Bretague* speaks of efficiency, the actual Toulon squadron is felt to be too weak to be at all worthy of France and to weigh much in the balance so far as high sea operations are concerned. Besides, the various phases of maneuvers of Brittany have shown that gunships have no chance to approach undetected within

striking power of an enemy coast, and still less chance to escape without heavy losses out of all proportion with the damage they might expect to inflict. Of course, Admiral Salaun had no seaplane-carrier such as exists in the British and American fleets, and for this reason, only limited conclusions can be drawn from the failure of his attacks on Brittany. Bombardment is by no means a thing of the past. Seaplane-carriers and also submarines of the British *M* type will, in future wars, bombard coasts with impunity, and even great inland centers having industrial (that is military) importance will be liable to swift destruction by bolts from the blue. The question which the maneuvers have yet to demonstrate is the effective radius of action of coastal organizations. Time, up-to-date matériel, and more active training on a wider scale are needed before sanguine dreams become reality.

If French *amour-propre* and sense of fairness still revolt against the Washington limitations, French naval opinion is not far from considering them as a blessing in disguise, and even if the Chambers should decide, on the motion of Députe de Grandmaison, to vindicate the sovereign rights of France in what concerns her naval policy (which is highly probable), the Washington affair will still have done good in contributing to altogether change the basis of sea power and to render obsolete, and utterly so, those fine super-Dreadnaughts of pre-war designs which Great Britain, Japan, and America have constructed at great cost since 1914, and which France chose not to complete (*Normandie* class). It has compelled the Paris Admiralty to reconsider its shipbuilding policy, to examine with greater care than ever before the case for the aerial and submarine weapons, and to definitely drop the twenty battleship program, on which Députe Chappedelaine had already reported favorably. And, considering anew those 35,000 tons *cuirassés* in the light of recent scientific progress, Paris experts have thanked the gods that they were not ordered and laid down as had been at first intended. Unanimous opinion seems to prevail as to the inadequacy of the 35,000-ton Panama Canal limitation to meet the several new defensive desiderata to which battleship designers must give satisfaction, if capital ships are to serve more useful purposes than those of extremely costly and vulnerable targets. The realistic experiments with new shells and bombs in the *Thueringen* at Gârves and in the *Prinz Eugen* in the Mediterranean, the easy way, especially in which turrets and funnels were wrecked, together with the powerlessness of 12-inch steel plates to withstand at fighting ranges the onslaught of post-war projectiles, have, after a series of researches and laboratory tests, led Paris experts to the conclusion that all existing battle fleets are (technically speaking) non-warworthy and out-of-date, and that, when armor-piercing, poisoning, and blinding projectiles and bombs, and also torpedoes and mines, have been duly provided against in battleship designs, it is found impossible to obtain a fast (and with new systems of motors) and powerfully-armed battleship under 50,000 tons, and even that high figure would not permit all points to be met, would not give *le cuirassé ideal* capable of surviving, for instance, the aerial attacks, most deadly of all (on paper), and of safely muddling through the Jutlands of to-morrow with the many surprises they have in reserve. The turret system notably calls for radical changes, and interesting innovations are rumored in this respect.—J. B. Goutreau, in *The Naval and Military Record,* 16 August, 1922.

FRENCH NAVAL LOSSES IN THE LATE WAR.—Paris, Aug. 7.—The losses of the French Navy in personnel during the war have just been officially announced. The total losses of the Navy in co-operation with the Army amounted to 2,449. The losses at sea totalled 8,888, of whom no fewer than 1,498 are reported as having disappeared.—*Naval and Military Record,* 16 August, 1922.

LOSS OF THE FRENCH BATTLESHIP "FRANCE." Paris, Aug. 28—The Minister of Marine exonerated Captain Guy from blame for the loss of the battleship *France,* at the entrance of the Bay of Quiberon. According to witnesses, the ship was in the right course and the chart gave a depth of sixty feet, but on account of the rock reef it was less than thirty. An attempt will be made to raise the ship, as one point of the dreadnaught is only about six feet under the surface at low tide, but little hope is held for the success of salvaging it on account of the powerful currents coming out of the bay to the Atlantic.

Paris, Aug. 28 (By the Associated Press).—The loss of the dreadnaught *France,* which foundered on the rocks of Quiberon Bay, Saturday morning, reduces the country's first naval line by one-seventh of its fighting strength and places the French navy on an equality with Italy's. It will be long before former superiority can be re-established, as the dreadnaught, which cost 40,000,000 francs to build, will cost about 200,000,000 francs to replace at to-day's prices.

The vessel will be replaced by one of similar type. The naval agreement, signed at Washington, gives France the right to replace any unit lost by accident.

Public regret finds some compensation in the coolness and bravery shown during the disaster, worthy the finest records of the French navy. Not a man left the ship before the admiral commanding the squadron, who was fully informed of conditions by wireless, ordered evacuation. The operation was carried out without confusion and methodically.

The first officer to leave by the commandant's order was a steward carrying the muster roll, cash and the ship's papers. Soon only staff officers remained aboard; they were thrown into the sea as the dreadnaught, whose list had been steadily gaining, rolled over a few minutes after 4 o'clock.

Captain Guy, commanding the *France,* was completing his final voyage; he had been slated for promotion to rear admiral. Captain Guy commanded a torpedo flotilla in these waters during the war.—*Boston Evening Transcript*, 28 August, 1922.

London, Aug. 30—England, it is learned officially, has turned a deaf ear to intimations from the Continent that the loss of the French battleship, *France,* last week, might be used as means of shifting the ratio established by the Washington conference for capital ships. According to reports reaching London the loss of the French ship threatens to become an issue between the French and Italian Governments and the attitude of England is therefore important.

Under the Washington treaty France is entitled because of the loss of its dreadnaught to replace the vessel immediately and "the regular replacement program is deemed to be advanced to that extent." The reason the question intimately concerns Italy and France is because neither of those two countries has any post-war capital ships built or building.

It is reported, therefore, that if France adds a post war ship to her fleet, Italy also wishes to ask for a reopening of the other question under chapter three of the Treaty which provides for an amendment by agreement. The suggestion made to England was that the presence of two ships in the Medeterranean might affect her interests, but the Admiralty says there is no reason it can see for any change in the present arrangements.—*Boston Evening Transcript,* 30 August, 1922.

JAPAN

LOSS OF THE JAPANESE CRUISER "NIITAKA." Tokio, Aug. 30.—The Japanese cruiser *Niitaka* went down in a typhoon off the Kamchatka coast August 26, with virtually all hands, according to confirmed advices received by the Admiralty. The naval report said that practically none

of her crew of 300 was saved. The destroyer *Maki* has been ordered to the scene of the disaster.

The *Niitaka* is a second-class cruiser of 3,420 tons displacement, launched in 1901.—*The Baltimore Sun,* 31 August, 1922.

SEEK AID FOR SHIPPING.—Kobe, Japan, Aug. 10—"The Government seems deplorably without any fixed policy towards the ever declining shipping enterprise of the empire, since the restoration of peace. If the country would maintain its position as at present among the world's Powers in this line of enterprise, more positive efforts should be made by the authorities for the improvement of the situation."

This is the resolution passed by a general meeting of ship owners. The meeting appointed a committee of nine who will shortly approach the Government authorities in Tokio with the above resolution.—*Boston Evening Transcript,* 31 August, 1922.

GERMANY

NO SIGNS OF GERMAN NAVAL REVIVAL.—The French papers continue to express concern at the possibility of a German naval renascence, preparations for which, they declare, are already in full swing under cover of an ingenious system of camouflage. M. Léfevre claims to possess detailed information on this point, but apparently his details are considered by the Allied authorities to be either incomplete or not sufficiently serious to warrant such action as would unquestionably be taken were it proved beyond dispute that Germany was evading the naval clauses of the Peace Treaty. Inquiries made in circles which ought to be well-informed have failed to elicit any confirmation of these French reports. On the contrary, the story of secret submarine construction in German shipyards is dismissed as a fairy tale. One very circumstantial rumor of this kind was traced to its source and found to have originated in the fact that the hulls of discarded *U*-cruisers were being used in the construction of oil-tankers. There is every reason to believe that an exact record of all the submarines that were built or building in Germany at the date of the armistice was obtained by the Allied control officers, and that the ultimate fate of every one of these craft is known. As regards the building of any new *U*-boats since the armistice, this would have been impossible without the cognisance of the control authorities, whose methods of inquiry and supervision have been far more searching than the French Press seems to realize.

Owing to shortage of funds the active fleet is still below the strength authorized by the Peace Treaty, both in personnel and material. New construction is limited to one 5,600-ton light cruiser, which is building or about to be built at Wilhelmshaven. Tactical maneuvers are occasionally held in the Baltic, but these are circumscribed by the necessity of economising fuel. Several vessels of the fleet will soon become valid for replacement under the age clause, but it is improbable that funds will be voted for this purpose in the near future. In short, Germany is not only virtually disarmed at sea, but shows no desire to rehabilitate her naval forces even within the permissible limits. For the time being she is devoting her main effort to the building up of her mercantile fleet, and with remarkable success, judging by the latest statistics from Lloyd's.

When the Treaty of Rapallo was concluded between the German and Soviet Governments there were reports of a secret protocol providing for military and naval co-operation. Germany, it was said, would undertake the reorganization of the Russian arsenals and dockyards, and then proceed to build a new fleet of submarines, ostensibly for Russia, but actually for her own use. This story is more plausible than that about secret construction in Germany itself, but the plan, if it really exists, is likely to prove difficult to carry out. German shipyard experts who have

reached Nikolaieff in pursuance of an agreement to modernize that establishment are said to have been unpleasantly surprised at their reception. They found the plant to have been almost destroyed by sabotage and neglect, the workmen idle, inefficient, and disobedient, and the local authorities unable or unwilling to support the German mission in its effort to restore things to an orderly state. Matters may eventually improve, but from the latest accounts it does not appear that the reorganization of Nikolaieff Dockyard has made much progress. Nor is it likely that the Germans will find conditions better at Kronstadt or Petrograd if they go there with the same purpose. Short of providing not only the material, but the whole of the labor themselves, their alleged plan of constructing a new navy in the Russian yards is likely to prove abortive, and German labor at present does not seem in the mood to lend itself to a new war plot.

Alarmist statements which have recently been published as to the strength of the Russian Navy are heavily discounted by the Admiralty Return of British and Foreign Fleets. According to this document only two of the Russian battleships in the Baltic are effective, viz., the *Marat* and *Paris Commune*, each of 23,000 tons, and an armament of twelve 12-in. guns. These ships are better known by their pre-Bolshevik appellation, *Petropavlovsk* and *Sevastopol*. Their sister vessels, *Gangut* and *Poltava*, are recorded as having "no military value at present." As for the four battle cruisers, *Navarin, Borodino, Izmail,* and *Kinburn,* displacing 32,500 tons and armed with twelve 14-in. guns, the first two were launched in 1917 and the second pair in 1915, but none has been completed up to the present, and building operations are at a standstill. It was reported from Paris a few weeks ago that the completion of these ships was being pressed forward with all speed. Of the four light cruisers laid down in 1913 for the Baltic fleet—6,800 tons, 29½ knots speed, fifteen 5.1-in. guns—the *Svietlang* and *Admiral Greig* were launched respectively in 1915 and 1916, while the *Butakov* and *Spiridov,* for which no launching date is given, may be still on the stocks, building having been stopped on all four vessels. As the older cruisers *Rurik, Bayan,* and *Admiral Makarov* have "no military value at present," the Baltic Fleet appears to have shrunk to the two Dreadnaughts named above, and, while the *Return* does not say so, it is quite possible that even these ships are no longer fully effective. The Baltic destroyer flotilla, which could muster on paper about 90 boats, has dwindled to eighteen effectives. Sixteen submarines are listed as effective, the majority being boats of 650 tons surface displacement. No further submarines appear to be under construction.

The Black Sea fleet has practically disappeared so far as serviceable units are concerned. It contains one old battleship, *Evstafi;* no cruisers, no destroyers, and three submarines, only one of which is a large boat. It will therefore be seen that to all intents and purposes the Russian Navy has gone out of business.—Hector C. Bywater in *The Naval and Military Record*, 16 August, 1922.

Report on Disarmament.—Lieutenant Colonel Stanley (to Commander Bellairs): "The latest report from the Inter-Allied Military Commission of Control shows that 33,484 guns and barrels of all kinds have been surrendered, and 33,410 have been destroyed up to date; in addition, 6,051 guns under construction were destroyed by the Germans prior to control; the records have been checked by the Commission; 87,377 machine guns have been surrendered and 87,351 have been destroyed up to date; 4,382,839 rifles and carbines have been surrendered and 4,369,330 have been destroyed up to date. The Commission consider that all important stocks or surplus war material in Germany have been surrendered for destruction, and that only a negligible number of guns, machine-guns and rifles may still be hidden by extremist parties. The Inter-Allied

Military Commission of Control have accomplished far more than the members of the Commission themselves considered possible at the outset of their work. The aeronautical disarmament of Germany was recognized as complete by the Allies on February 5, last. On that date, 14,731 aeroplanes had been surrendered and 14,260 destroyed. The Aeronautical Commission of Control has since been withdrawn.—*Army, Navy and Air Force Gazette*, 29 July, 1922.

A GERMAN LIST OF ZEPPELIN CASUALTIES—52 DOWN.—It was height against artillery, German Zeppelins against British guns and gun-carrying airplanes, and the Zeppelins got the worst of it. Nevertheless, the German airship-makers were prepared to try conclusions once more, at an altitude of 22,000 feet, when the war ended. Airplanes have since, of course, far surpassed this height, but a Zeppelin sailing over four miles high, especially aided by darkness and occasional clouds, could have met and beaten off any planes able to reach this altitude, so the Germans argued. Some statistics of the Zeppelins and other airships employed by the German Navy during the war, notes the London *Times*, have recently been published, for the first time, in the *Marine Rundschau*. It is officially recorded that the Allies destroyed 26 of the airships, and that 26 others were the victims of accident. Included in the report is a complete list of the ships, with the names of their commanders and watch officers, the date of their being put into Service, the number of cruises and attacks made, their air-port stations and a brief account of their ultimate fate. The *Times* summarizes and comments:

From first to last the German Navy had at its disposal 78 airships. Six were either air training-ships or were used for special purposes, so that 72 took part in actual scouting and operations. The figures show that the average for each vessel was 16 cruises and three attacks. The maximum number in commission at any one time was 19. The highest number in commission in a single year was 39 in 1917, but the greatest number of cruises and attacks was made in 1916. In that year the 31 airships in commission at various times made 296 cruises and 107 attacks. But it was also the year of the greatest losses. Eight were destroyed by enemy action, four by storm, and four by explosion. In the following year nine were lost by enemy action, and five by storm. The total loss for the whole period of the war was 52, made up as follows: Destroyed by enemy action 26; destroyed by storm, 14; destroyed by explosion, 12. Besides these, however, 17 others went out of service for various reasons.

Full particulars are given about the various stations. The double shed at Fuhlsbüttel was burned down on September 16, 1916. That at Tondern was burned out three times and rebuilt. Of the four double sheds at Ahlhorn, three were blown up and totally destroyed in the great explosion which took place on January 5, 1918.

Of the 52 airships lost, the crews of 19 were killed, the crews of six taken prisoners, and the crews of three were interned. In the case of the other 24 there was no loss of *personnel*. Nine airships were left in commission when the Armistice was declared, including the two school airships at Nordholz. One was in course of construction.

Of the six Zeppelins put into commission in 1914, *L-3* and *L-4* were stranded during the storm of February 17, 1915; *L-5* was stranded at Dünamünde, in Courland, on August 6, 1915, after being hit by enemy fire; *L-7* was shot down in flames by the enemy on May 4, 1916; *L-6*, the training-ship, exploded in its hangar on September 19, 1916; and *L-8* was shot down in action on March 5, 1915, and stranded at Tirlemont. Twelve were put into commission in 1915. *L-18*, commissioned on November 3, 1915, caught fire in the hangar at Tondern, a fortnight later, while being inflated. *L-9* blew up in the hangar at Fuhlsbüttel on Sep-

tember 19, 1916, and *L-10* was struck by lightning above Neuwerk Island on September 3, 1915. Of the rest, *L-12*, *L-15*, and *L-19* were shot down; *L-17* blew up in the explosion at Tondern; *L-20* was stranded at Stavanger, in Norway; *L-11*, *L-13*, and *L-16* were dismantled, and only *L-14*, the training-ship, survived to be handed over at the Armistice.

Of the 1916 ships, *L-21*, *L-22*, *L-23* (at sea), *L-31*, *L-32*, *L-33* (over London), *L-34* (over Sunderland), and *L-39* (over Compiègne), were shot down. *L-24* caught fire while entering the hangar at Tondern, and caused the explosion which destroyed *L-17*. *L-25* to *L-29* were Army ships. *L-30* and *L-37* went out of commission in 1917, and were handed over to the Allies at the end of the war. *L-36* and *L-38* were stranded.

The 1917 ships suffered bad losses both from explosions and in action. The great explosion at Ahlhorn on January 5, 1918, accounted for *L-46*, *L-47*, *L-51*, and *L-58* besides the Schütte-Lanz, *SL-20*; *L-57*, which had been intended for the expedition to German East Africa, exploded in mid-air on her trial trip on October 7, 1917, fourteen days after completion. The entire crew perished, and the cause of the disaster was never discovered. She was succeeded by *L-59*, which made the trip, but was recalled when over the Sudan because the Germans had then evacuated German East Africa. This vessel bombed Naples, and was engaged in an expedition to bomb Malta when she came down in flames in the Strait of Otranto for reasons unknown, as she was not then under attack.

The following were destroyed in action: *L-43* (in the North Sea), *L-44* (near Lunéville), *L-45* (over Sisteron), *L-48* (after bombing the Suffolk area, brought down by the *R. F. C.*, with Commodore Schütte on board), *L-49* (near Bourbonnes), *L-50* (in France, afterwards sailed away without crew), *L-53* (by British airman while scouting), *L-54* and *L-60* (by a British airman while in the hangar at Tondern), and *L-55* (over Tieffenort, in attack).

The Zeppelin war had been a continuous struggle on the part of the Germans to attain altitudes that could not be reached by the defense. In the summer of 1917 they had reached altitudes at which human beings could not live without oxygen (afterwards compressed air was used). The type *L-53* to *L-55*, then in use, had a cubic capacity of 56,000 cubic meters and a maximum altitude of 18,000 to 20,000 feet. But in 1918 they found their attacks badly hampered by British airplanes and the "excellently organized artillery" in England, and they were at best able to attack only in cloudy weather. After Captain Prölz was brought down with *L-53*, it was decided temporarily to abandon attacks till the new type, with a cubic capacity of 62,000 cubic meters and an altitude of 22,000 feet, was ready. Fortunately the German Navy mutinied and the German front collapsed before this was ready. *L-71* was handed over with the other eight to the Allies, and *L-72*, still unfinished, was ultimately completed and surrendered to France.—*The Literary Digest*, 19 August, 1922.

UNITED STATES

NAVY MEN AT COLUMBIA.—Thirty-three officers of the United States Navy are studying the problems of the modern warship and submarine in Columbia University's Summer session. One group of fourteen officers, among whom are captains Victor A. Kimberly and William R. White, are concentrating on the theory and application of the gyroscope. Another group of nineteen officers is pursuing specially arranged courses in preparation for regular training in the engineering schools of Columbia during the next academic year. The naval officers come to Columbia through an arrangement between the United States Naval Academy and the university.

The courses are the first of their kind arranged for Annapolis graduates, who never before have had summer instruction outside of the navy, and

represent an extension of the academy's general plan of co-operation with universities and technical schools. The practice of sending officers to Columbia, interrupted by the war, was resumed two years ago, and will be continued during 1922-23 by the nineteen officers who are now receiving preparatory training.

Contrary to custom, these officers, instead of doing postgraduate work at Annapolis, in various manufacturing plants or in the navy yards, are reinforcing their knowledge in the laboratories and classrooms at Morningside. The courses were devised by Dean George B. Pegram and his associate in response to a request made by Commander J. G. Fisher, head of the Postgraduate School at Annapolis. The naval authorities aim to provide more thorough training in advance of the winter and spring work of the officers at Columbia.

This group of nineteen is taking three intensive courses of two weeks each, Dean Pegram said recently. The first two weeks were devoted to work in physics of heat in special preparation for the later study of thermo-dynamics and mechanical engineering subjects. Professor W. L. Severinghaus of the Columbia department of physics, directed this work, which was followed by two weeks of study in alternating currents, involving theory and laboratory practice, under the guidance of Walter I. Slichter, professor of electrical engineering at Columbia.

During the closing two weeks of the Summer session, the officers are attacking the problems of electric storage batteries. This work is in charge of Professor Morton Arendt, who during the war was in control of construction of storage batteries for the navy submarine school in London, attaining the rank of commander.

The successful introduction of the electric drive on battleships and battle cruisers, it is said, makes this knowledge necessary to the officers responsible for ships of these types. Storage batteries are used in the underwater propulsion of submarines and the schooling which the officers are receiving this summer is necessary for subsea operation and for the safety of crews, accidents having resulted in the past from storage battery troubles.

The group of fourteen officers, mostly lieutenants, are supplementing their knowledge of the gyroscope under Professor A. G. Webster of Clark University, said to be one of the country's leading authorities in the field of dynamics. This course, it is said, is being given for officers of various grades, for the reason that it has become essential that a considerable number of the commissioned personnel of the navy be skilled in everything that relates to gyroscopics.

The navy uses the gyroscopic compass in the navigation of all its larger ships, and the problem of gyroscopic stabilization is highly important. Another field of importance, it was said, is the application of gyroscopic instruments to aircraft.—*New York Times,* 25 August, 1922.

A COMPARISON OF THE AUXILIARY FLEETS OF JAPAN, GREAT BRITAIN, AND THE UNITED STATES.—London, July 27.—Cable messages from Washington this week foreshadow developments in American naval policy which are believed here to be traceable to the activity now prevailing in Japanese dockyards. The General Board of the United States Navy, it is reported will recommend that Congress, in the session beginning in December, be requested to make appropriations for a considerable amount of new auxiliary tonnage, without which the ratio of strength *vis â vis* Britain and Japan cannot be maintained. As the ten scout cruisers of the *Omaha* class, 7,500 tons each, have been greatly delayed by inadequate funds, the American Navy today has not a single first-line cruiser in commission. The General Board is therefore said to be urging the rapid completion of these 10 ships, so that work can be started on a further group of cruisers designed on larger and more powerful lines. It is also

said to have recommended the addition to the submarine program of new boats for scouting and mine-laying duties.

Naval opinion on this side of the Atlantic considers the General Board to be fully justified in demanding more light cruisers in view of the American fleet's pronounced weakness in such vessels, but there is some misgiving as to the effect that the introduction of a new program would be likely to have on the international situation. That Japan has diverted to the construction of cruisers and submarines a large part of the money and labor she formerly expended on dreadnaughts is no longer a secret. There are so many of these auxiliary fighting craft now building or on order that both the Government and private shipyards have been able to keep most of their men on the pay roll, and there has been as yet no counterpart in Japan of the wholesale discharges of navy-yard personnel which have occurred both in Britain and the United States since the Washington Conference.

As time goes on the consequence of that fatal flaw in the limitation agreement, which left the signatories a free hand in respect of auxiliary construction, becomes more manifest. In so far as it aimed at ending naval competition in any shape or form the agreement has failed of its purpose. Rivalry in dreadnaughts has simply given place to rivalry in cruisers, submarines, etc., and while this form of competition may be less expensive, it may be quite as dangerous from the political point of view. At the risk of repeating information which has already been published in *The Sun* it is desirable to set forth once more the salient facts of the naval situation as it exists today seven months after the close of the conference.

(1) The limitation agreement specifies a ratio of 5-5-3 for the dreadnaught strength of the United States, British Empire and Japan, respectively. This ratio will actually prevail when the scrapping operations now in progress have been completed, since there is no question as to the loyalty with which all three powers are observing the letter of the agreement.

(2) The above-mentioned ratio was originally intended to embrace not only capital ships, but all types of men-of-war. This intention was defeated by the failure of the conference to agree on the allocation of submarine tonnage, and as every type of vessel below capital grade was ruled by the experts to be a potential anti-submarine craft, the possibility of unlimited underwater construction naturally led to the abandonment of restrictions on the building of all light-surface vessels.

(3) Japan has been the first power to take advantage of this liberty of action in respect of auxiliary fighting craft. With the possible exception of France, she is the only signatory which has laid the keels of new cruisers, destroyers and submarines since the limitation agreement was negotiated at Washington, and she is the only one now at work on a large program of these vessels. Taking all ships completed, building and authorized, the three-power ratio in light cruisers now stands approximately as follows: British Empire, 4.5; Japan, 3; United States, 1. This is based on the number of ships. If tonnage were taken as the basis the American position would be better; but numerical strength is what really matters, seeing that a ship can only be in one place at a time. Age is also an important factor in gauging efficiency, and on that showing Japan comes out still better, for of the 29 cruisers she will possess a few years hence, 24 were laid down subsequent to 1917, as against 6 British and 10 American.

(4) The Japanese submarine flotilla is very much stronger both in numbers and individual power than is generally known, and no other navy in the world is building so many large ocean-going boats. It is difficult to explain the exact position without bringing in a mass of figures, but I will try to make these as few as possible. At the present moment the

United States has the most submarines, *viz.*, 124, of which total 41 are still incomplete. This excludes 22 obsolete boats which have been scrapped during the present year. Fifty-six boats are of the long-range ocean-going type, that is to say they have a radius of 5,000 miles or more. The British Empire has 66 submarines, including six in Australia and two in Canada, but not counting 27 which are marked down for scrapping this year; and of this total about 40 are of long-range, ocean-going type. Japan has approximately 75 boats completed and building and at least 24 more authorized for commencement. This gives a minimum total of 99, but—and this is the really significant fact—not less than 80 of them are ocean-goers with a cruising endurance of 5,000 miles in the medium type and up to 12,000 miles in the larger type.

During the past three years no coastal submarines have been built in Japan, every boat laid down within that period having been designed for long-range cruising. Among those now completing and projected are many of 1,500 tons displacement and few of 2,000 tons. The newest boats are likely to be still larger. In their effort to hit upon a thoroughly efficient design the Japanese authorities have not only incorporated all the best points from the German boats handed over to them, but have sent experts to Europe to investigate the most up-to-date features of British, French and Italian submarine construction.

Japan's future fleet will thus comprise the following fighting units: Ten capital ships, 29 fast cruisers, more than 100 modern destroyers, 80 ocean-going submarines and an indefinite number of older torpedo craft and submarines which will still be effective for coast defense. In view of her magnificent strategic position, which makes her practically impregnable to direct attack, the number of auxiliary combatant craft she is building must be considered excessive for purely defensive needs. It would seem, therefore, that aggressive operations figure prominently in her war plans, the lavish provision of cruisers and long-range submarines pointing clearly enough to enemy merchant shipping as a target for special attack.

To say that Great Britain is becoming alarmed at the outlook might be an overstatement, but she certainly is dissatisfied with the way events are developing. As a state which depends for its existence on sea-borne supplies she is vitally concerned for the safety of her sea communications over any menace which invariably reacts on her naval policy. Her present relations with Japan are amicable enough, if not quite as cordial as they were, and there is no apparent reason why they should deteriorate to the point of bringing that power into the category of probable enemies. Nevertheless, if the Japanese shipbuilding program is carried out in its entirety, Great Britain cannot possibly rest content with her present establishment of cruisers and anti-submarine craft.

Even as it is, naval officers are anxious for more cruisers to be laid down, for, as they point out, very few of the ships we now have would be of any use whatever for operations in the Pacific. The majority of them were designed for North-Sea work and therefore do not possess the weatherliness or the fuel-endurance essential to ocean cruising. As a matter of fact, we have only six ships above 5,000 tons which are fast enough for modern war operations. The supply of destroyers would also be inadequate to cope with submarine raids on British shipping. Besides the hundreds scrapped since the armistice, a great many other boats have been laid up for economy, and as there is no money for repairs most of them are going to rack and ruin. It is doubtful whether we could now muster more than 150 effective destroyers.

Overburdened with taxation as they are, the British people are extremely reluctant to spend more money on armaments, particularly after being told that Washington had eliminated naval competition for many years to

come. They do not even relish the prospect of paying £16,000,000 for the two new battleships allotted to Great Britain under the agreement, and the Government's decision to proceed with these ships is encountering much opposition. Consequently, to be told now that a big program of auxiliary shipbuilding will probably have to be adopted in the near future is a bitter disappointment to them, and when it is realized that the action of Japan is mainly responsible for this there is likely to be a revulsion of popular sentiment against that country.

Auxiliary craft, it is true, are cheaper than battleships, but their cost has gone up enormously of late years. A modern ocean cruiser cannot be built for less than £1,500,000, which is only £500,000 less than the price of a pre-war dreadnaught, and the cost of other types has increased in proportion.

In the meantime the effect on American public opinion of the Navy General Board's demand for more ships to offset Japanese preponderance is awaited here with keen interest, not out of idle curiosity, but because it is felt that this demand may eventuate in a movement to have the whole question of minor naval armaments, with special reference to submarines, reconsidered at a second conference. This course was, I believe, recommended by the Italian delegates at the first gathering when it became clear that no settlement was to be reached in the submarine dispute.

It would, however, require great moral courage to convene a fresh conference for the avowed purpose of restricting, if not wholly abolishing submarine development, in view of the strong opinions which both France and Japan are known to entertain on this matter. The Government taking such a step would unquestionably expose itself to a rebuff, but the issue at stake is momentous enough to justify the risk. The world is already threatened with a recrudescence of that naval rivalry which is, by common consent, the most fruitful cause of war. Great Britain's hands are tied, because her notorious vulnerability to submarine attack lays her open to the charge of pursuing her own selfish interests if she seeks to do away with that particular mode of sea warfare. If, therefore, a lead is to be given at all, it must be given by the United States. Only a new conference can complete the work that was so well done up to a certain point and then left half-finished by the initial gathering at Washington.—Hector C. Bywater in *The Baltimore Sun,* 10 August, 1922.

MERCHANT MARINE

SHIPPING BOARD'S MONETARY LOSS EXPLAINED.—Why can our mercantile fleet not be operated profitably under Government ownership? The first impulse is to reply that under present arrangements no reason exists why it should not be. At the head of the traffic and operating divisions of the Shipping Board are practical shipping men of wide experience who have successfully helped to direct the activities and promote the business of private shipping concerns. The assumption that they should be able to duplicate these efforts on behalf of the Government with equally gratifying results is a reasonable one. It is conceded that the red tape of officialdom hampers them, but this should affect merely details and not policies.

Furthermore, the four hundred Government ships in service are being operated by managing agents who have been thoroughly tried in regard to ability and integrity. By the process of elimination these vessels are now entrusted to the most expert shipping men in the country, and are in commission on a basis removed only by a step from that of private ownership. It is also true that much of the Government's tonnage is inefficient, but the ships actually in service are the cream of the fleet and comparable with any other vessel afloat. Similar ships which have been sold by the Board to private owners are being operated successfully, thereby

disproving the inefficient tonnage argument. Neither can the incompetency of crews and higher wages be advanced as sound reasons, inasmuch as the Shipping Board has the same opportunity as a private owner to secure competent crews at the same wages. Despite these facts the unqualified assertion is frequently made, and left unquestioned, that Government ownership of vessels is an insurmountable handicap to profitable operation. The conclusion therefore is that some cause underlying the conditions of physical operation and preventing the application of strict business methods is responsible. This reason is to be found in the fact that Government tonnage belongs to the citizens of the United States and that the wishes of different communities in regard to it must be considered and catered to.

Here then is the fundamental difference between Government and private ownership, a situation which is often lost sight of when the activities of the Shipping Board are considered. In planning the services of its ships a private concern has regard only for the trade possibilities of its routes. It serves only those ports where cargo is offering in paying quantities. The Shipping Board, on the other hand, has to take into account the additional factor of rendering service where it is demanded, whether or no that service is financially profitable.

Hence we find a condition in which Government vessels are compelled to call at various ports not because adequate cargoes can be obtained there, but because the communities demanding the service claim that they have a proprietary interest in the ships. The Shipping Board cannot turn a deaf ear to these demands and is compelled to heed the requests. The Board must not only listen to the dictates of business practice but also to the voice of the American people. Thus a situation exists in which Government vessels are calling at ports which would be ignored by private companies. The service rendered raises the prestige of the port and its community, but the cargoes secured are in many instances insufficient to cover the cost of making the calls. Therefore in the final analysis the Government is losing money not so much because of inferior methods of operation but in giving service which a private company is not called upon to provide.

This is a circumstance over which the Board has no control. Since it has to face this ever-constant demand for service, much of which is not financially advantageous, the Government is at a disadvantage when its position is considered in relation to that of a private concern. It must employ business methods not only as good as but better than those of its private competitor, if this handicap is to be overcome. But since private companies have been compelled to run their business on a basis of the most rigid economy and effectiveness the difficult task confronting the Government in endeavoring to improve on these measures is at once apparent.

This naturally leads to the question as to what the Shipping Board is doing in trying to inject recognized business methods into its activities. It is admitted that the present régime is making a far better showing than that of its predecessors, and the operating losses have been greatly reduced without impairing the services. This has been accomplished by the simple expedient of creating a confidence on the part of the American shipper in Government vessels. A year ago shippers studiously avoided utilizing Government vessels because of the unreliability of their movements. Sailing schedules were arranged but rarely adhered to. If a ship did not have a full cargo on the date of her advertised sailing, she would be held until such time as her holds were filled regardless of the delay to the cargo placed in the ship prior to her scheduled sailing date. Thus a shipper could never be sure of the day on which his goods would leave port, and delays of a week, a month or even longer, were frequent.

Nothing could destroy the confidence of shippers in Government tonnage more effectively than these delays and the state was reached where solicitors of business for Government ships found it impossible to produce results.

This condition has been completely changed, and Shipping Board vessels now sail on their advertised date irrespective of whether they have full cargoes or not. When this policy was first adopted the ships often sailed with as little as half their cargoes, and in consequence the operating losses were very heavy. By adhering rigorously to this system the confidence of shippers in Government vessels has been largely restored, for they now have reasonable assurance that the ships will sail on scheduled time, and it is correspondingly easier to secure freight for them. Ships that a year ago were leaving port with half cargoes are now sailing fully loaded, or nearly so and, if this policy is adhered to, it will not be long before American shippers will have absolute confidence in Government ships.

The rationing system adopted by the Board in recent weeks is also in line with the most approved business methods. According to Joseph E. Sheedy, vice-president of the Emergency Fleet Corporation, the division of operations of the Shipping Board is attempting to carry on its work "on as near a commercial basis as possible." The rationing system is divided into four main branches as follows: fixed allowance for subsistence, fixed allowance for repairs, fixed allowance for stores and fixed allowance for fuel. By this means it is expected that the Board will be enabled to make a considerable reduction in its operating appropriations in addition to increasing the efficiency of operation of its ships by the managing agents.

The Board is actually losing approximately $3,000,000 per month in cash as a result of its operations, but viewed in its broader aspect this amount is in reality being spent for the creation of goodwill. The loss is incurred not through inferior operation, but in the rendering of service as a result of which new trade will be developed and business built up. Although ships are incurring losses through having to call at certain ports, a goodwill is being created in these communities which will bring better business conditions in the future. Therefore although the Shipping Board is facing an unavoidable situation in having to serve these ports it is doing good work in laying the foundation for future trade. The day will come when the losses now being incurred will be more than repaid by the larger volume of business which will be transacted as a result of the service which Government tonnage is now giving, and ships that are now serving these ports at a loss will be able to do so at a profit. In this regard the Board is in the position of any other large business concern. A corporation entering a new industry expects to lose a large amount of money each year in the development of business and the creation of goodwill. Viewed in this light the losses of the Board are not exorbitant since they amount annually to about 1½ per cent of an invested capital of three billions of dollars.

It is not an exaggeration to state that if the Board were free to send its ships where it pleased regardless of the demand for services its financial showing would be as creditable as that of any private concern. But it must be remembered that its object is to build up a merchant marine for the future and in this work it is fulfilling its mission. If its present policy is carried through to its logical conclusion, a goodwill will be created for American ships that will serve as an inducement for private capital to invest in Government tonnage. A shipowner will more readily buy ships if they can be placed in a trade in which they are regarded with confidence and where sound business connections are already established. Therefore the Shipping Board is really paving the way for the disposition of its ships to private owners on a basis which will ensure the profitable operation of the vessels.

The logical outcome of this policy is for the Board to devise a scheme whereby private shipping interests can purchase Government tonnage on easy terms and so carry on the work which the Board has commenced. Losses are being incurred in the building up of an American merchant marine, but if, as is contended, the possession of a successful mercantile fleet is a matter of national importance, then it is only fair that the nation should bear the cost of pioneering.—*The Nautical Gazette,* 5 August, 1922.

ADVOCATES SHIP SUBSIDY. Williamstown, Mass., Aug. 22 (Special). —The problem of American shipbuilding was discussed today at the Institute of Politics, where R. T. Merrill, of the Bureau of Research of the United States Shipping Board, was invited to address a round table under the chairmanship of W. S. Culbertson. Mr. Merrill said that America could not hope to compete with the shipping of other countries for years to come on account of the high cost of American labor. A successful merchant marine, he said, depends on three factors—plentiful and cheap coal, iron ore and labor. America has reached a point where material used in building ships is available and cheap, but this is not true of American labor, he added. American labor is fifty cents higher than foreign labor, and about fifty per cent of the shipping costs go into labor, he argued.

The British visitor, Philip Kerr, said the cost of labor was largely a matter of the cost of living, and intimated that this was, in his opinion, bound up with such questions as protective tariffs. Mr. Kerr said the prosperity of one nation was bound up with the prosperity of all and that he did not feel any jealously because America wanted to build up her merchant marine. He assumed that the more business America did the better it would be for the industries of other countries.

Describes Merchant Warfare

In the opinion, however, of navy men at the conference the whole process of foreign trade is a kind of war which is carried on in peace time by means of merchant fleets and in war by means of these fleets plus battleships. Admiral Rodgers, chairman of the executive committee of the General Naval Board, said that before the days of international cooperation desired by Mr. Kerr, when the lion and the lamb would lie down together, the lamb would also have to learn a few lessons in throat-cutting.

Admiral Knapp emphasized the absolute necessity, in his mind, for a merchant marine. The fact should be kept in mind that the further off naval or military operations are likely to be in time of war the larger is the merchant marine needed, he pointed out. It takes, for instance, about twelve tons of shipping per year to keep a man in France, he said, and it is, roughly speaking, true to say that if the scene of possible operations were twice a given distance, twice as large a merchant fleet would be needed to keep up the shipment of supplies in time of war. The necessity of proper communications system also was stressed by Admiral Knapp as being not only essential to commerce, but to the fleets in time of war. He said he hoped to see a great increase in American foreign commerce, as this would not only justify a large American merchant marine, but an adequate navy.

Advocates Ship Subsidy

Mr. Merrill abandoned all hope of America being able to compete in the tramp steamer traffic. He said this class of business was such that cargoes could only be carried at very low rates and nothing in the way of improved service was obtainable by hiring skilled men instead of the low-

priced variety now employed. America might, however, do more in freight traffic on liners, where higher freight rates were paid for more efficient service, he said. Nevertheless, there are still difficulties because of American high cost of operation and he hoped that the Ship Subsidy bill would be passed.

"Since the merchant marine," he concluded, " is essential to the economy of the country and since the ships and the shipyards are necessities from the standpoint of naval defense, there remains only the alternative of meeting from the national Treasury, since it is for national needs, the additional cost of ships built in American shipyards in order that our vessels, placed upon a parity as far as construction costs go, may compete with a reasonable prospect of success against the products of the cheaper labor in foreign countries."—*Baltimore Sun*, 23 August, 1922.

World's Merchant Tonnage at Close of Fiscal Year.—The following table, taken from Lloyd's *Register* for 1922-23, shows the number and gross tonnage of the vessels of 100 tons and upward belonging to each of the principal maritime nations of the world in June last:

Country			No. Ships	Gross Tons
Argentine			216	181,555
Belgium			275	579,477
Brazil			399	492,571
British Empire:				
United Kingdom	8,849	19,295,637		
Australia and New Zealand	636	766.038		
Canada—Coast	877	1.020.984		
Canada—Lakes	72	170.070		
Hong Kong	94	231.869		
India and Ceylon	214	235.100		
Other Dominions	579	322.822		
Total			11,321	22,042,520
Chile			126	131,401
China			134	188,388
Cuba			65	62,677
Danzig			42	107,231
Denmark			822	1,038,138
Esthonia			98	45,259
Finland			352	213,671
Fiume			64	81.362
France			2,094	3,845.792
Germany			1.723	1,887,408
Greece			379	668.127
Holland			1,164	2.632.713
Italy			1.413	2,866,335
Japan			2,026	3,586,918
Jugo Slavia			65	81.204
Latvia			67	40,124
Norway			1,852	2,600,861
Peru			74	101,209
Portugal			286	285.878
Roumania			31	72,297
Spain			973	1,282,757
Sweden			1,345	1,115,375
United States:				
Sea	4.886	14,738,506		
Great Lakes	495	2,247.690		
Philippine Islands	99	76,264		
Total			5,480	17,062,460
Uruguay			53	76,311
Other counties			799	691,635
Country not stated			197	309,132
Total			33,935	64,370,786

Below are shown the changes in the tonnage of the countries enumerated above as compared with a year ago:

Country	Tons Gross 1921	1922	Difference
Argentine	167,154	181,555	+14,401
Belgium	551,031	579,477	+28,446
Brazil	499,325	492,571	−6,571
British Dominions	2,499,244	2,746,883	+247,639
Chile	113,447	131,401	+17,954
China	163,037	188,388	+25,351
Cuba	58,553	62,677	+4,124
Denmark	964,464	1,038,138	+73,674
Esthonia	41,183	45,259	+4,076
Finland	198,352	213,671	+15,319
France	3,652,249	3,845,792	+193,543
Germany	717,450	1,887,408	+1,159,958
Greece	599,929	668,127	+68,198
Holland	2,225,787	2,632,713	+406,926
Italy	2,650,573	2,866,335	+215,762
Japan	3,354,806	3,586,918	+232,112
Latvia	53,342	40,124	−13,218
Norway	2,594,058	2,600,861	+16,803
Peru	87,167	101,209	+14,042
Portugal	296,847	285,878	−10,969
Roumania	73,973	72,297	−1,676
Spain	1,165,541	1,282,757	+117,216
Sweden	1,160,211	1,115,375	−44,836
United Kingdom	19,571,554	19,295,637	−275,917
United States	17,026,002	17,062,460	+36,458
Uruguay	85,886	76,311	−9,575
World Total	61,974,653	64,370,786	+2,396 133

Sixth of World's Merchant Tonnage Idle.—According to latest advices, over 10,000,000 gross tons of shipping or approximately one-sixth of the world's merchant fleet is now idle. Of this unemployed tonnage about 4,625,000 tons is laid up in American ports and flies the United States flag.

Although the American merchant marine has been harder hit than any other, British shipping has also been severely affected, and whereas the American figures are stationary, or show a slight improvement, British records show a continued falling off.

Idle ships in British ports number 600. In this country the Shipping Board has tied up about 1000 steel vessels in addition to the 300 wooden ships.

There were approximately 1,700,000 gross tons of vessels flying the Union Jack laid up in the principal ports of the United Kingdom on July 1, as compared with 1,300,000 on April 1. Taking into consideration the smaller ports and shipping laid up in foreign harbors, it is estimated that 1,900,000 tons of British shipping is eating its head off in idleness, or ten per cent of the total merchant marine of the Kingdom.

Although the tonnage laid up is not generally the most efficient, the average value of the idle vessels is estimated at not less than $45 a gross ton. Thus the total capital involved the world over is in excess of $450,000,000. The cost of the Shipping Board vessels now idle is placed at $1,000,000,000 alone.—*Nautical Gazette,* 19 August, 1922.

Clyde Shipbuilding Nearly Cut in Half.—Within a year the amount of tonnage under construction on the Clyde has decreased by almost one-half. At the end of June of last year Clyde shipbuilders had on hand 238 vessels of a total measurement of 1,346,328 tons, while at the end of last month the total amount of work under construction had shrunk to 106 vessels of 680,346 tons.

The falling-off is not confined to any particular type or size of vessel, but is general all around. At this time last year there were 27 motorships

being built on the river, but now there are only 12, the total tonnage of which is 82,132 tons.—*Nautical Gazette,* 5 August, 1922.

BOARD'S ACTIVE AND IDLE SHIPS.—The Shipping Board issued a statement last week showing what disposal was being made of the Government's 1,648 ships on July 31. The first table shows the number of steamers covering the various trade routes:

Route	Ships	Deadweight tons
United States Government	4	38,636
Northern Europe	166	1,424,651
Southern Europe	34	268,117
Orient and Australia	70	718,257
Africa	9	76,840
South America	39	317,042
West Indies	11	45,937
Foreign service	19	111,966
Coastwise	9	56 941
Totals	361	3,058,387
Steel vessels tied up	913	5,875,388
Wooden vessels tied up	236	869,441
Vessels chartered to independent companies	30	137,565
Tankers	90	805,676
Under custody of United States Shipping Board as mortgagee	3	23,283
Awaiting orders or reconditioning	2	27,004
Awaiting assignment	10	74,663
Under custody of United States Shipping Board pending disposition		10,550
Awaiting delivery to purchaser	1	5,610
Contract steel cargo vessel unfinished	1	9,400
Grand totals	1,648	10,897,007

RELATIVE RANK OF LEADING MARITIME COUNTRIES.—The following table shows the comparative positions of the twelve leading maritime countries in 1914 and in 1922:

	1914	1922
1	Great Britain	Great Britain
2	Germany	U. S. A.
3	U. S. A.	Japan
4	Norway	France
5	France	Holland
6	Japan	Italy
7	Holland	Norway
8	Italy	Germany
9	Austria-Hungary	Spain
10	Sweden	Sweden
11	Spain	Denmark
12	Greece	Greece

MOTORSHIPS BUILDING IN JUNE.—Of the 866 vessels of 3,235,430 gross tons reported by Lloyd's *Register of Shipping* to be building in the world's shipyards, except those in Germany and Danzig, at the end of June, 103 of 251,328 tons were motorships. More than half of this motorship tonnage was under construction in Great Britain. Details are shown in the following table:

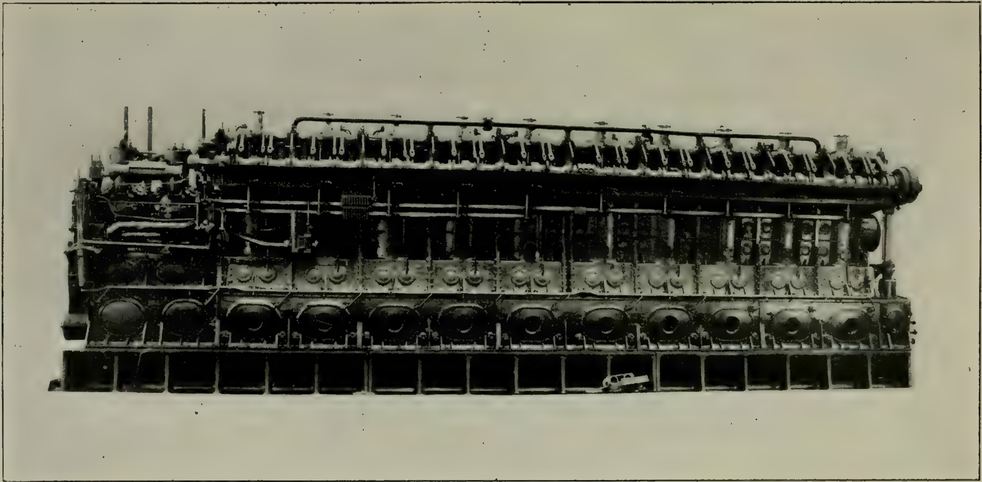
Country	No.	Gross Tonnage
British Dominions	1	253
Brazil	1	2,170
Denmark	6	22,855
Esthonia	8	2,791
Fiume	2	340
France	1	8,500
Greece	1	600
Holland	12	10,800
Italy	18	23,048
Norway	3	7,720
Portugal	3	1,700
Sweden	12	32,119
United Kingdom	32	129,134
United States	3	9,298
Total	103	251,328

ENGINEERING

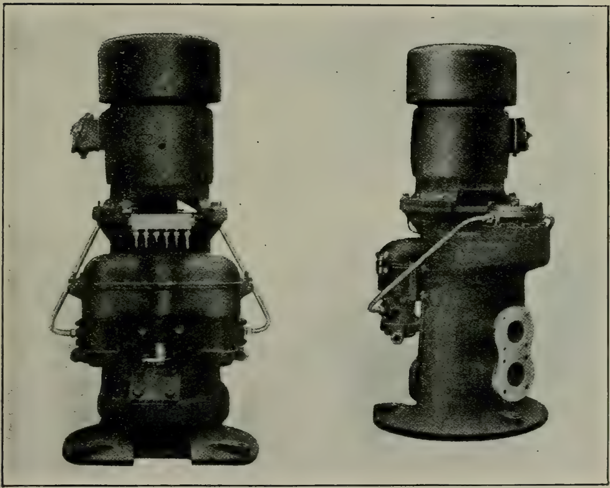
NEW 3,000 H.P. DIESEL ENGINE FOR SUBMARINES.—M.A.N. 4-cycle, 10-cylinder engine, 20.866″ bore X 20.866″ stroke: Rated Brake Horsepower 3000 at 380 R.P.M. Length overall—37′7″; width overall—5′7″; height overall—11′4″; height over crankshaft—9′0″; weight of engine-only (dry) 160,000 lbs; about 80 tons or 55 lbs. per rated horsepower; two-cylinder air compressor of 1265 ft. per minute, free air capacity (16.1 per cent of working cylinder volume); 4 stages—2500 ft. per square inch discharge pressure; circulating water piston cooling oil and lubricating oil furnished by motor driven pumps. Air starting and direct reversible.

ELECTRIC DRIVE FERRY BOATS.—New York City shows confidence in the reliability of the electric drive as plans and specifications have been completed for three large ferry boats to operate between New York City and Staten Island. Each vessel is to have 2,200 shaft horsepower. The power plant consists of four water tube boilers with working pressure of 250 pounds, one main turbo generator designed for 2,300—3,000 volts at 3,000 revolutions, and two propulsion motors of the three-phase alternating current induction type. As these motors drive screws, which are stern or bow propellers depending on the direction in which the vessel moves, an unusual problem is introduced which is solved by providing two stator windings for each motor. When operating as a stern propeller the appropriate stator winding permits the motor to deliver 2,100 shaft horsepower, whereas while operating as a bow propeller the other stator winding permits the motor to deliver only about 100 shaft horsepower.—*Bureau of Engineering Bulletin.*

A NEW TYPE OF CENTRIFUGAL PUMP.—With the introduction of electrically driven centrifugal pumps for marine service, there has been a tendency of late to adopt the vertical spindle design in preference to the horizontal type over which it possesses certain advantages. In addition to its being lighter and occupying less floor space, the upright pump is more easily accessible, its alignment is more certain and is less likely to be disturbed by connecting pipes or the movement of the ship. Furthermore the position of the motor is such that it is easily protected from water, and its commutator is readily examined. While the centrifugal pump, however, is quite practicable for direct sea pumping for salt water circulating systems, salt water piston cooling, and sanitary work, there are many pumping duties aboard ship for which the ordinary type of centrifugal pump is not so satisfactory on account of the unavoidable presence of air in the suction system. This means that the pump and the suction pipe must be primed before water can be raised. In bilge and ballast pumping on board ship, there is usually air present in the



NEW 3,000 H. P. DIESEL ENGINE FOR SUBMARINES
(For description, see page 1806)



Front and Back Views of the Drysdale Centrex Pump

suction pipe, owing to small leakages in pipe joints, the occasional uncovering of the strum boxes when the ship rolls, and the fact that the ship construction does not always allow of the free flow of water to the suction pipe, especially when the tanks are nearly empty.

In order to overcome this difficulty, Drysdale and Co., Limited, of Yoker, Glasgow, have recently introduced a new design of pump, known as the centrix, in which the air is first separated from the water, after which both air and water are dealt with separately by properly designed pumps. The action of the Centrex pump is thus analogous to the newer systems which are used in connection with the marine surface condenser.

The illustrations we give above will serve to show some of the chief features of this pump. The main casing which, unless otherwise specified, is in cast iron with renewable wearing parts, is extended to form an air-separating chamber and the motor seating. It is provided with a hand hole, giving access to the impeller eye, and it is in two parts so as to enable the impeller and spindle to be removed without breaking any pipe joints. The hydraulic design of the pump is such that by using a single-sided type of impeller the thrust is in the upward direction, and the whole unit is practically free from bearing pressures when the pump is running. The air pumps are two in number, and are constructed of gun-metal. They are driven from the pump spindle through a cross shaft by means of worm gearing. The suction valves are of the piston valve type, while the discharge valves are of the metallic disc type, and are readily accessible. It will be noted that the suction and discharge branches are situated at the back of the pump directly over one another, thereby doing away with the necessity of banding the pump. The bearings are arranged for easy examination, and the thrust and end journal bearings are of the ball type, the former having two ball races, so that it can take the thrust in either direction. The electric motor is drip-proof and its design incorporates the best features of the vertical spindle protected type. The pump we have described has, so the makers inform us, been applied to motor ship service with success.—*The Engineer,* 4 August, 1922.

A NEW REDUCTION GEAR.—A new invention which marks an important development in gear construction, and which can be applied with advantage in all cases where it is required to increase or reduce gear, is the "H.R." reduction gear which is being developed by the "H.R." Gear Co., Ltd., 168, Regent Street, W. 1. The chief point of interest, perhaps, is found in the absence of the usual spur wheels and the introduction of worms and wormwheels.

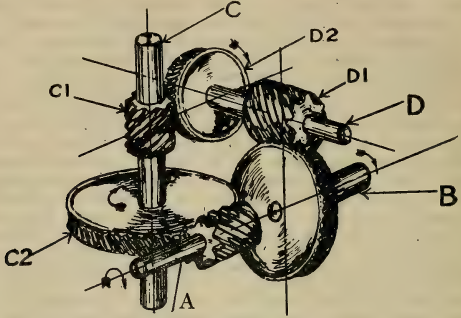
It can, moreover, be used as an alternative to ordinary spur reduction gearing whenever the latter is applied. Ratios of 100,000 to 1 can be obtained in the simple form of gear, and in the compound gear 10,000,000 to 1, although the gear is very small and compact in spite of the enormous reductions given.

The H.R. principle lends itself to a remarkably neat and simple form of variable ratio gearing in which, with the addition of one element, a three-speed gear is obtained and with two additional elements five speeds are possible. These variable ratios can permit, if desired, the rotation of the driven-shaft in the same direction as the driving shaft at all speeds, or any desired number of ratios may be used for reverse motion.

In addition, a special form of gear-cage provides an extra reversing gear. In all forms of multi-ratio and reverse gearing the efficiency of the H.R. gear remains approximately constant. The same methods being employed for all ratios as for the single reduction no intermediate trains or extra gears are in operation.

This last feature is likely to have great influence on automobile design, particularly when a direct drive is employed on top speed as no

noisy lay-shaft or constant mesh pinions are engaged. In this connection absolute silence at all speeds is an important feature. By a suitable arrangement in mounting the various elements eight or twelve changes of speed can be obtained, and by mounting the shafts at other than right angles around the main shafts almost any number of speeds can be obtained.



WORKING PRINCIPLE OF H.R. REDUCTION GEAR

The H.R. principle, being entirely new, opens many avenues of gear application which have hitherto been considered impracticable. In many respects its application makes possible that which before was impossible, as, for instance, the starting and lighting of motor vehicles by a single unit machine; special hoist and crane arrangements; direct mechanical stokers; scrapers for boiler economizers, etc.

With the present form of gearing used in conjunction with steam turbines, electric motors, petrol motors, etc., driving slow-moving parts, such as ships propellors, fans, heavy machinery, a compromise in efficiency has to be accepted and relatively heavy power units must be used. In other words, owing to the practical limit of ordinary gear reductions as regards space, weight, efficiency, etc., either the driving or driven member has to turn at a greater or less speed than that at which it would give its highest efficiency. With the H.R. gear there is practically no limit to the gear ratios which can be used.

One important feature where necessary is the addition of a cushion reaction and safety device. This enables gear reduction to be used satisfactorily where intermittent overloading has hitherto been a continuous source of trouble, as for instance, in the case of crushing, grinding, and rolling machinery.

This gear revolutionizes the electrical equipment of the automobile, being absolutely silent, almost impervious to wear, running as it does under ideal conditions, whilst eliminating a considerable number of parts and reducing equipment costs.

As the axis gear shafts are placed at right-angles to the axis of the driving and driven shafts four to eight additional drives can be obtained from the extremities of the gear shafts.

The working principle of the H.R. Reduction Gear is as shown in Fig. 1. Two shafts (C and D) are mounted transversely to the driving and driven shafts (A and B) and are connected by a worm (C1) on the shaft (C) and a worm wheel (D2) on the shaft (D). A worm wheel

(C2) on the shaft (C) is in gear with a worm on the driving shaft (A) and a worm (D1) on the shaft (D) is in gear with a worm wheel on the driven shaft (B) so that the essence of the invention is the placing of gear shafts around the periphery of the driving worm and the driven worm wheel, thus giving concentricity.—*Engineering and Industrial Management*, 10 August, 1922.

THE MODERN OIL ENGINE.—In discussing the heavy-oil engine, engineers are too much inclined to revert back to its early history in judging its present comparative worth. It is true that at one time breakages of crankshaft, cylinders and cylinder heads were frequent, but this is by no means different from the results obtained with other prime movers when first built.

Realizing that engineers should appreciate the wonderful strides made by the oil engine in recent years, Dr. Lucke describes in this issue some of the difficulties met with and the steps taken to overcome them. As he points out, the greater number of parts of an oil engine closely correspond to like parts of the steam engine, and these in themselves have given little trouble. It is the process of combustion within the cylinder that caused most of the high maintenance of former days. The method of introducing the fuel into the cylinder is better understood now, and as a consequence broken parts are seldom encountered.

Dr. Lucke states that there is but little difference in the results obtained from two- and four-stroke-cycle engines. One has more moving parts, but to offset this disadvantage has a better fuel consumption. Many may disagree with his contention that the small units should be two-stroke-cycle while the large engines should be four-stroke-cycle, for apparently both types are used successfully in the same capacity range.

Of especial interest is the discussion on the solid-injection engine. If it is possible to build an engine without an air-compressor that will show as good results as the air-injection Diesel, it would seem that by a lower manufacturing cost the former would speedily overcome the Diesel's superior position.

Apparently, the solid-injection principle will be used only on engines of small powers when the advantages of the air-injection Diesel cannot offset the decrease in interest charges resulting from the use of the cheaper unit. Undoubtedly, in time each type will find its own field, when it can be used to the greatest advantage, in the same way that the semi-Diesel at the present time has a range of capacities where it proves more economical that the Diesel.—*Power*, 15 August, 1922.

MARINE DIESEL ENGINES. *Difference in Design.*—At the last meeting of the Diesel Engine Users' Association, Mr. H. F. P. Purday, B. Sc., A. C. G. I., A.M.I. Mech.E., read a paper on "Marine Diesel Engines." In referring to the main points of difference in the design of marine Diesel engines as compared with land engines, he pointed out the fact that the hull of the ship being subject to more or less violent motion did not form the rigid foundation which was provided in the case of the land engine. It was, therefore, necessary to provide for considerable rigidity in the engine frame or in the seating in order to avert troubles due to the main bearings getting out of alignment. Crankshafts considerably stronger than those used in land practice must also be provided. To provide for ability to start up from any crank position it was also necessary to use engines having a certain minimum number of cylinders, namely, at least six for the four-stroke engines, and four for the two-stroke engines.

The marine Diesel engine had the advantage of unlimited cooling water being available, and with the temperature kept within reasonable

limits there was practically no deposit. This was a great advantage in reducing the risk of piston seizure, cracked covers and cracked pistons, etc. All marine Diesel engines were also fitted with crossheads and guides, which practically eliminated the trouble of piston seizure.

After referring to the principal types of marine Diesel engines, the author dealt with the subject of the four-stroke and two-stroke engine, and referred to opposed piston two-stroke engines using solid injection and air injection of fuel. The "Still" engine was mentioned as being in a class by itself. There was considerable controversy on the subject of heat stresses, and there could be no question but that the provision of relatively small two-stroke cylinders to perform the same work as relatively large four-stroke cylinders did entail some thermal problems of an important character.

In dealing with fuel injection systems, the author stated that so far the best fuel consumption with the solid injection system seemed to be associated with high maximum pressures, which were penalized by the registration societies. When the maximum pressure was limited to 500 lbs. per square inch the fuel consumption was usually slightly higher than with the air-blast system.

The permissible mean pressure for two-stroke engines depended largely on the efficiency of the scavenge process.

The piston speeds of two-stroke engines were generally between about 500 and 700 feet per minute. Comparatively low piston speeds had been adopted on account of the desirability of making use of low scavenge pressure in order to secure a good mechanical efficiency, and to keep the revolutions low on account of the propeller efficiency. Two-stroke engines, however, were not necessarily restricted to low piston speeds.

The author discussed the thermal difficulties of large Diesel engines, and pointed out that the trend of modern design seemed to be to eliminate extensive temperate stresses by dividing the castings into smaller pieces having considerable freedom from expansion. He favored the practice of providing concave crowns to pistons, as the further the center of the crown was away from the fuel valve the less heat it would presumably receive.

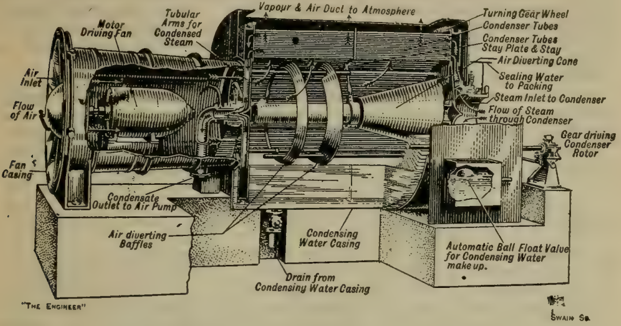
The author took the view that the Diesel engine must be seriously considered in the near future for propelling large engines requiring something like 16,000 s.h.p. per shaft.

In the discussion that followed, the view was expressed that further development of the marine Diesel engine was likely to follow along the lines of the double acting two-stroke engine. Further interesting information was given concerning the cylinder construction of the "Still" engine.

Reference was made to the greater use of the larger sizes of engine for land use on the continent and in other countries abroad. This was possibly due to some extent to the fact that this country was a coal-producing country. Stress was laid on the importance of reducing as far as possible the cost of manufacture, and a point was made that the present high cost of the larger units for land use was due to the comparatively small demand up to date.—*Engineering and Industrial Management*, 27 July, 1922.

A ROTARY EVAPORATIVE CONDENSER.—The steam condenser shown in the accompanying drawing, which is made to the designs of Mr. D. M. Ramsay by Fullerton, Hodgart and Barclay, Limited, of Paisley, is of topical interest, as it is of the same type as that installed on the new condensing turbine electric locomotive described in our issue of March 24, last. The condenser is, however, not necessarily confined in its application to locomotive work alone; it is being put forward for general

service where cooling water is scarce, and it is nevertheless desirable to have a high vacuum. It is, in fact, claimed that this condenser requires only 1 lb. of water for every 1 lb. of steam condensed, and that it will, at the same time, maintain a vacuum of 29 in.



THE RAMSAY ROTARY EVAPORATIVE CONDENSER

On reference to the drawing, it will be seen that the active part of the condenser comprises a cage of small tubes expanded into two headers and mounted on hollow trunnions. One of the trunnions provides a means of ingress for the steam to be condensed, while the other forms an outlet for the condensate and the incondensable gases. The header at the inlet end is divided up by a number of radial partitions, and there is a baffle at this end, which blanks off the lower sector-shaped partitions. In this way the steam is guided into the upper nests of tubes and kept away from the lower part.

The whole cage is slowly rotated by mechanical gear in a tank which is filled with water to such a depth that all the tubes are, in turn, immersed. As the tubes rise out of the tank they are covered with a thin film of water, and it is the evaporation of this film, under the influence of a strong draught produced by a fan, that absorbs the heat given off by the steam in the process of condensation. This draught of air enters the cage of tubes at the opposite end to the steam, and after being distributed by a number of baffles escapes at the top of the casing.

It is, of course, necessary that the two trunnions should be kept airtight, and to this end they are equipped, not only with stuffiing-boxes, but also with a water service for sealing purposes.—*The Engineer*, 28 July, 1922.

DIESEL ENGINES AS AUXILIARIES ON BATTLESHIPS.—The installation of Diesel engine driven electric generators in the U. S. S. *Maryland, Colorado,* and *West Virginia* marks another step in the development of motive power for capital ships. The U. S. S. *Colorado* and *West Virginia*, which are now nearing completion, have two 400-kilowatt, 240 volt generators, each driven at 350 revolutions per minute by a 950 horsepower Busch-Sulzer Diesel engine. Two balancing sets will be provided to enable the generators to be used on the ship's 120 volt lighting circuit. A similar installation will be placed in the U. S. S. *Maryland* upon her return from Brazil, and it is also planned to equip the new airplane carriers *Lexington* and *Saratoga* with two of the same type of generators.

After this installation is completed these ships will be able to dispense with fires under their boilers when lying in port in moderate weather, as the extension of electric pump equipment in addition to other electrical appliances which have been placed in ships since the completion of the *New Mexico* class, will enable these great ships to carry on all their port activities without the use of steam. Large economies in fuel oil consumption will result upon the installment of these Diesel engine driven generators, because comparison of an oil driven engine with a steam engine shows a relative economy of about one to three.

Naval engineers have been working for years to develop this improvement of motive power for warships. The installation of Diesel engine generators will be watched with great interest because it marks another important success in the various steps in the evolution of naval engines. The Navy designed and built the first large ship with turbine engines about twelve years ago. The turbine marked an improvement in economy over the reciprocating engine but to attain its greatest efficiency the turbine must be run at a speed too high for the ship's propeller. Naval engineers, therefore, developed the geared turbine to meet this objection.

The U. S. S. *Neptune* was the first big ship in the world to be driven by a reduction gear. Then naval engineers designed and built the U. S. S. *Jupiter* which was the first big ship to have electric drive, and the U. S. S. *Maumee* which was the first big ship to have Diesel engine drive.

The next step in the development was the designing and building of the U. S. S. *New Mexico* in which oil burning boilers furnish the steam which drives turbine generators, which in turn generate electricity for use in electro motors, which drive the ship's propellers.

The next step will be the ship in which Diesel engine generators furnish electricity for driving the main propelling motors and for all other machinery in the ship, and in which boilers will be used only for heating purposes. The installation of the Diesel engine generators in the *Maryland, Colorado,* and *West Virginia* will provide for a thorough test of these generators under service conditions and this will enable naval engineers to develop better Diesel engine generators which will then be installed in the next ships the Navy builds.—*Navy Department Bulletin,* 4 September, 1922.

AERONAUTICS

A HALF YEAR'S CIVIL AVIATION.—The half-yearly report on the progress of civil aviation issued towards the end of the month by the Air Ministry, recorded little, if any, commercial development during the period from October 1, 1921, to March 31, 1922. A small increase in the number of passengers carried was accompanied by a large drop in the value of the goods imported and exported between this country and the Continent, and by a fall of over two-thirds in the number of out-going and incoming letters. On the technical and organization sides, however, a little progress was recorded in the report. In connection with signalling and navigation a system was introduced whereby in bad weather a pilot flying within a radius of about ten miles from Croydon can be informed of his position by means of a "sound locater" and wireless telephony. The combination of line and wireless telephony was successfully experimented with by connecting the Croydon control tower telephone by line to the wireless apparatus. By this means an office in London was enabled to speak directly with an aeroplane in flight. The arrangements made to permit of flying by night on the London-Paris route were brought to a state of completion sufficient to enable them to be put in use at short notice. These arrangements consist of various route lights and illuminated wind-indicating signs, and are constructed to operate for a year without attention. For use in foggy or misty weather an improved design of beacon

flare, giving an intensified color light, was evolved. The total sum for civil aviation included in the Air Ministry estimates for 1922-23 is £364,000, not counting £35,500 for the headquarters staff and £51,000 for the Meteorogical Office. Of this sum, £200,000 is to be applied to the direct assistance of approved firms operating cross-Channel air services. Under the hire-purchase scheme by which the companies can acquire machines built by the ministry, the sum to be received is estimated at £16,000.—*The Engineer*, 4 August, 1922.

AIRCRAFT APPROPRIATIONS, 1922-23.—The following sums were appropriated for Aviation for the fiscal year 1922-23:

Air Mail	$1,960,000
Army	12,895,000
Navy	14,803,560
N.A.C.A.	210,000
	$29,808,560

—*Aviation*, 7 August, 1922.

2,000 PLANES TO DEFEND U. S. Washington, Aug. 6.—A definite and comprehensive program to provide an adequate air defense for the United States has been worked out by the air experts of the army and navy and is ready in tentative form for submission to Congress whenever it is finally approved.

For months experts of the Navy's Bureau of Aeronautics and of the Army Air Service have been working out this program along separate lines but with closest co-operation, and it is now ready for the Navy and War Secretaries, who are expected to use it as the basis of their recommendations to Congress this fall.

With the realization that plans involving the expenditure at this time of many million dollars and the construction of from 1,000 to 2,000 new planes of all types would "die a-borning" while Congress still faces a nation-wide demand for economy, it is understood that a progressive program extending over several years, similar to the navy's 1916 building program, will be recommended.

Just how far the two services will go in seeking immediate funds is problematical, as this is a departmental policy that will be decided finally by the higher powers. This will depend somewhat on aviation developments abroad.

Ever since the bombing tests about a year ago, there has been a constantly increasing public interest in aviation, the aviation people say, and recent events again have brought it to the front. They point to the significance of the announcement Friday by Premier Lloyd George that England was to build 500 airplanes at a cost of thousands of pounds, it being understood that this was but a step in a gigantic aerial program. Another event was the successful exploitation of the torpedo plane, not only in our own navy, but by the British.

America's aerial program as tentatively drawn up by the army and navy experts can be summed up roughly as follows:

1. Provision for enough new planes to enable the Army Air Service to have 500 machines on each coast and approximately 1,000 planes at strategic points in the interior.

2. Detail of 2,500 officers and 40,000 men to the Air Service.

3. Construction of between 250 and 300 new airplanes for the two huge aircraft carriers into which two of the treaty-doomed battle cruisers are being converted.

4. Equipment of every fighting ship and many of the auxiliaries with an airplane, catapult and, whenever possible, landing gear, something like 300 planes being needed for this.

5. Quantity production of the deadly torpedo plane of the all-metal type as soon as the experiments being carried out demonstrate the most suitable type for use on ships.

6. A systematic development of landing fields at seaports for the fleet flyers' use, and the landing fields along definitely laid out aerial lines all over the country.

While this program would call for an initial outlay of many millions of dollars and an upkeep and replacement cost that would run into big figures, the aviation proponents stress the fact that this cost, while large, is insignificant when compared to the cost of $40,000,000 battleships, and that it is vital to the national defense that aviation be developed to the fullest.

Air service heads believe that the army's force should be strong enough to repel any enemy that might threaten an attack; that the definite burden of providing the first-line of defense, so far as land attack is concerned, rests upon the regular army; that sufficient force to enable the keeping of 500 planes on each coast and 1,000 in the interior should be provided; that a definite system of airways should be established throughout the country, with established landing fields and supply stations at regular intervals; that emergency landing fields be made at frequent intervals, utilizing cow pastures or other available sites, but marking them and registering them on maps for use by all flyers, and plans for speedy transportation of supplies by air in a war emergency.

At present the air service has something like 600 planes in active service. In addition to planes being constructed and those that could be put back into service in case of necessity would run the number up to more than 1,000. Eventually the plans drawn up would double that number of serviceable planes and considerably more than double the officers and men now in service.—*Baltimore Sun*, 7 August, 1922.

NAVY PLANE FLIES WITHOUT A GUIDE. Washington, Aug. 24.—A new type of seaplane which is almost capable of flying without a pilot, has been delivered to the Navy Department. The plane, designed for the training of student aviators, combines safety features never before equalled in aircraft, navy officers said, with qualities of speed and maneuverability.

It was delivered at Anacostia after a successful 700 mile flight from Ogdenburg, N. Y.

"In testing the plane the pilot released the controls, taking his hands and feet off of them," said Commander T. G. Ellyson, of the Bureau of Aeronautics, who brought the craft to Washington.. "The throttle was cut to low speed and the plane went into a long glide. He then speeded up the engine and, still without the control being touched, the plane leveled off and continued in normal flight.

"Finally the engine was speeded up with the throttle wide open. The plane began to climb. She fell off on one wing and dived until a speed of 100 knots was registered, when the plane again leveled off in normal flight. During the entire demonstration, the pilot, Lieutenant Nielson, did not touch the control.—*Detroit News*, 24 August, 1922.

AIRCRAFT IN NAVAL WARFARE.—Owing to the fact that somewhat exaggerated accounts of the effects of the attack on the Atlantic Fleet by torpedo-carrying aeroplanes, recently carried out in the presence of His Majesty the King, have been circulated, the Admiralty has issued a statement explaining that the attack was arranged more with regard to spec-

tacular effect than as a critical experiment in methods of naval warfare. The element of surprise was entirely lacking, and the attack was quite undisturbed by any counter-offensive action on the part of the naval vessels. The conditions were thus entirely favorable to the aircraft, but in spite of this fact, the number of hits obtained on the battle line was small, and of minor tactical importance. It should thus be apparent that since the conditions of the attack bore so little resemblance to those existing in actual warfare, no useful conclusions as to the effect of this class of aircraft on the security of the Fleet can be drawn from these exercises. —*Engineering,* 28 July, 1922.

BOMBING THE "AGAMEMNON."—As a spectacle the aircraft tests against the *Agamemnon* last week were very impressive, but they have not done much to settle the battleship controversy. The number of bomb hits that were registered at 8,000 feet was only three per cent, and as this probably represents the minimum height to which aircraft operating by daylight could safely descend in the face of intense fire from A.A. guns, the bomb menace would seem to have been exaggerated. The experiment also showed that bomb-dropping at any considerable altitude is still very unreliable, despite reports of the invention of highly efficient bomb sights. The point-blank attack delivered by four *Snipes* was rather more suggestive. Had it been made by more machines and with "live" bombs of heavy caliber the damage inflicted must have been serious. Short-range attacks of this kind are a possibility in future warfare, especially under cover of darkness, when the bombing planes might be preceded by other machines dropping flares, which would illuminate the target without revealing the assailants. In such circumstances anti-aircraft fire would be of doubtful utility. On one point all the spectators of the recent test were agreed, namely, that the aeroplanes were handled with remarkable skill and dash. Further trials will shortly be held, this time to determine the actual effect on the ship of bomb bursts above and below the water. If the missiles used are at all powerful the *Agamemnon* should prove an easy victim, for she is an old ship with protection that falls far short of the modern standard.—*Naval and Military Record,* 16 August, 1922.

ALL-METAL AIR FLEET FOR GREAT BRITAIN. London, Aug. 18—England's fleet of 500 airplanes which the Government decided to authorize early this month will consist largely of all-metal machines, and when the total number is completed this country probably will have more than twice as many planes of this type as any other nation. Four of the models to make up the backbone of British air defenses are likely to be flying boats, which are smaller and speedier both as a fighting and troop carrying plane, and are capable of accommodating twenty-five soldiers each. Experimental planes of these types already are well under way and British producers say they have perfected construction methods by a scientific study of stresses and strains which have enabled them to construct frames much stronger than those heretofore made.

The discoveries actually are the result of war co-operation, when the bigger plants constructing airplanes were given the service of Oxford and Cambridge scientists for research work. Most companies have continued that collaboration, which has resulted in some improvements that have been carefully watched and reported on by United States naval and military forces.

The air ministry is not yet satisfied that the ultimate has been reached in the development of metal airplanes and machines, which, when virtually completed, will be subjected to tests twice as rigid as those for wood and fabric planes, in order to discover where their weakness exists so as to overcome such defects.

Because of those experiments it is not the intention of the Government to place the contracts for all 500 planes contemplated at once, but build up the fleet gradually, embodying all the improvements brought out as the tests progress.

Another factor which must be taken into account for some of the delay is that many manufacturing plants since the war have decreased their facilities for the production of planes or accessories and are unwilling to expand those tremendously for just a short period, preferring to take the work as slowly as their present facilities will permit.—*Boston Evening Transcript,* 18 August, 1922.

SETS NEW GLIDER RECORD. Berlin, Aug. 25.—A new record for sustained flight in a motorless airplane was set yesterday by Herr Hentzen, student flyer of the Hanover Technical School, when he remained in the air more than three hours. The flight was made on the concluding day of the gliding competition held in the Rhoen mountains, near Gersfeld. Hentzen's machine landed 350 metres above the starting point.

Hentzen is the flyer who startled the world of aviation last Saturday by remaining in the air two hours and ten seconds, breaking all records by a considerable margin.—*Boston Evening Transcript,* 26 August, 1922.

AMUNDSEN DEFERS FLIGHT OVER POLE UNTIL SPRING. Nome, Alaska, Aug. 29.—Captain Roald Amundsen, Norwegian explorer, has definitely abandoned for this year his plan for an airplane flight from Northern Alaska across the North Pole to Spitzbergen or Grant's Land, but plans to hop off next spring, it became known today, with the arrival here of the Coast Guard cutter *Bear* from Point Barrow.

Captain Amundsen told the correspondent of the Associated Press, who joined the *Bear* at Point Barrow, that the start had been delayed by unfavorable ice conditions and that the season was too far advanced to permit success.

Captain Amundsen landed his plane and equipment at Wainwright, 100 miles southwest of Point Barrow, and will make that point the base for his flight.

Radio advices from Captain Amundsen's exploration ship *Maud* indicate the vessel is frozen in the ice near Wrangel Island. The explorer expects to rejoin the *Maud* by airplane some time next year.

Ice conditions in the Arctic off the Northern Alaskan coast are the worst in many years. Captain Cochran, of the *Bear,* guided his vessel for miles through tremendous ice floes, reaching Point Barrow with difficulty.—*Baltimore Sun,* 31 August, 1922.

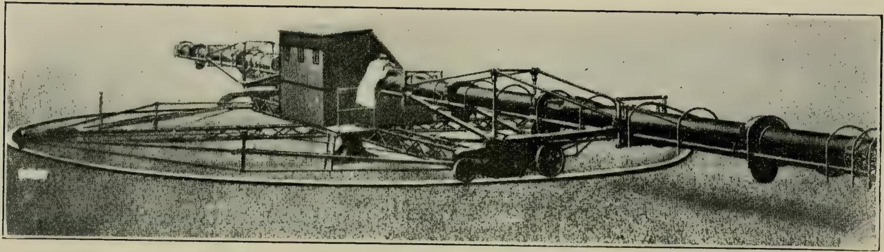
ORDNANCE

NEW MACHINE GUN RECORD SET BY NAVY PLANES.—A world's record with machine guns was made by naval fliers in the annual target practice of the air force of the Pacific fleet recently completed, according to a report received by the Navy Department from Captain H. V. Butler, commander of the air craft squadron.

Hitherto a hit every two seconds was considered excellent shooting with a fixed machine gun. Three of the naval fliers in the recent tests scored the phenomenal average of 123 hits in twenty-two seconds. This record was established by pilots of the fighting plane squadron.

The machine guns used were of the Vickers type synchronized to fire through the propellers. These guns are on fixed mounts and are aimed at the target by maneuvering the plane.

Lieutenant G. Cudhay scored 145 hits in 27 seconds. Lieutenant L. Hewett hit the target 137 times in 18 seconds, and Lieutenant W. B. Gwin landed 87 hits in 21 seconds, making the average of 123 shots in 22 seconds.—*Boston Evening Transcript,* 30 August, 1922.



The Largest Range-Finder. Built for British Coast-Defense Work. It Is 100 Feet Long and Is Said to Give Accurate Readings Up to a Range of 22 Miles

—*Scientific American,* September, 1922.

British Torpedoes for Use with Torpedo Planes.—A minor though not unimportant question raised in the discussion concerns the type of weapon used by our present torpedo planes. Viscount Curzon says it is a 14-in. model of a very unreliable kind, with a maximum range of one thousand yards. If this be true, we are far behind the Americans, whose latest planes carry a 21-in. torpedo with a powerful warhead. Great length of range is not essential in torpedoes designed for air carriage, since the nature of the attack postulates delivery at comparatively close quarters. If our torpedo planes are unable to carry large torpedoes it means that they are of obsolete design and should be replaced by machines of a modern type. Part of the Air Ministry's £11,000,000 might be profitably expended in this way.—*Naval and Military Record,* 26 July, 1922.

The Electric Gun Shrinking Furnace.—Up to January 15, 1920, all tubes, hoops, jackets, recoil bands, etc., assembled at Watervliet Arsenal were heated in an oil-fired furnace to the required temperature. The temperature to which the various forgings are heated is the lowest temperature which will provide sufficient expansion to take care of the shrinkage allowances on the male piece and provide sufficient clearance for the ready assembly of the heated forging. The temperature to which the forgings are heated is seldom in excess of 800° F. and must always be less by a safe margin than the last annealing temperature used in manufacturing the forging which is under consideration so as not to affect its physical properties. The last annealing temperature is usually between 1,000° and 1,200° F. so that 800° F. is considered a safe temperature to heat all gun forgings to.

In heating a gun forging to secure the required expansion it is absolutely necessary that it be uniformly heated throughout and not too rapidly. In order to accomplish this result, it is imperative to heat the forging without having the flame come in contact with it. It is also desirable to have control of the temperature at different points in the furnace so as not to overheat or raise the temperature of the thinner sections of the forging too high while heating the thicker sections of the forging to the desired temperature.

The oil-fired furnace which used crude fuel oil consisted of a boiler plate cylinder, lagged on the exterior with an asbestos covering to provide heat insulation. Inside of this cylinder there was a wall of fire brick. Next came the fuel and air pipes of the furnace proper, the fuel and the air at about forty pounds pressure per square inch being fed through the oil burners. The fuel feed pipes consisted of four vertical pipes running the entire length of the furnace. Auxiliary feed pipes consisting of cylindrical rings were connected to the main feed pipes every five feet. Four oil burners were attached to each cylindrical feed pipe, the burners on the alternate feed pipes being located one-half way between the burners on the feed pipes adjacent to it so as to stagger the burners and not concentrate the heat in a vertical line. Valves controlling the flow of fuel and air were brought to the outside of the furnace.

The oil-fired furnace was very unsatisfactory in that it was necessary to light the burners individually and to adjust the air and oil on each burner if a change in temperature inside the furnace was desired. It often happened that during the heating of a large forging (which in some instances requires as much as twenty-four hours) the burners would become dirty and refuse to burn longer so that it was necessary to have men in constant attendance, climbing around the outside of the furnace in order to keep the burners adjusted and burning properly.

A cylindrical baffle of three-eighths inch boiler plate was provided for the inside of the entire furnace so that the flame from the burners would play on the baffle plate, thereby preventing it from coming in contact with the

forging which was being heated. The flame on the baffle plate was directed at an angle so as not to heat it red hot and burn through.

All forgings were supported from the bottom of the furnace. No forgings were ever suspended from the top of the furnace, as the construction was such that sufficient strength could not be readily provided to accomplish this desirable feature.

On January 15, the oil furnace collapsed and it was necessary to repair it immediately or to install the new electric furnace. The latter course was decided upon and since it was expedient to complete the installation at an early date, in order to avoid stoppage of all work on the manufacture of 14-inch and 16-inch guns, three-shift operation was authorized and the new electric furnace was completely installed and ready for operation in April, 1920.

This furnace is composed of thirteen sections, each section being approximately 6′ 8″ inside diameter, 10′ 5″ outside diameter and 5′ 6″ high; each section requires sixty-eight kilowatts at normal voltage, giving the entire furnace a rating of eight hundred and eighty-four kilowatts.

The actual depth of the furnace is 72′ (each section being a complete mechanical and electrical unit) and operates on a 3-phase, 220-volt, 40-cycle circuit at unit power factor. Power is supplied to the furnace from an 11,000-volt, 3-phase, 40-cycle transmission line connected to three step-down, oil-cooled, oil-insulated, outdoor type transformers of 400 k. v. a. capacity each. The transformers have an 11,000-volt primary winding and a 230/460 volt secondary winding, being connected in series multiple on the low voltage side, the connection being 3-phase delta.

The secondary winding of the transformer consists of four 115-volt coils, the coils being connected in groups of two inside of the transformer to form two 230-volt windings, four cables are brought through the transformer permitting a series connection giving a voltage of 460 volts or a series multiple connection giving a voltage of 230 volts, the latter voltage being the one used in operating the furnace.

Power is conveyed from the transformer busbars to the switchboard through three one million circular mil, extra flexible, varnished cambric cables, there being located on the switchboard three single pole air brake circuit breakers. The switchboard is provided with current and voltage transformers for operating a graphic meter installed on the board. There are located on the switchboard eighteen automatic contactor switches, one contactor switch being required for each section of the furance. The extra five contactor switches are used for operating a smaller electric furnace similar to the one described but which consists of only five sections, being used for shrinking of smaller cannon.

A control room is provided having one panel for each section of the furnace, each section having a triple contactor switch electrically operated by fuses. On each panel there are mounted two ammeters; ammeters being provided for two of the three phase lines. Current transformers are mounted on the rear of the main switchboard. On each control panel there are also mounted two indicating watt-meters, indicating the load on each section of the furnace. Toggle switches mounted on a desk-like panel placed directly in front of the recording pyrometers are so located that the operator does not have to move in order to operate the contactor switches placed on the main switchboard. With this arrangement he is able to cut off or turn on the power on any section of the furnace as required. Each section of the furnace is provided with two adjustable thermo-couples located on opposite sides of the section, one being located near the bottom of the section and one near the top.

The sections are arranged so that the thermo-couples are staggered throughout the entire length of the furnace. The thermo-couples are adjusted so that they actually come in contact with the metal of the gun

or forging which is being heated. The temperature readings of the twenty-six thermo-couples are recorded in thirteen minutes automatically by a Leeds & Northrup recorder. There are two Leeds & Northrup recorders, each one recording the temperature of thirteen thermo-couples.

Each section of the furnace being a separate mechanical and electrical unit makes it possible to remove any section (simply by lifting it off with a crane) and use it as a separate furnace at any convenient location.

A structural steel and iron inner and outer frame is provided as a part of each section, being so constructed that the outer frame carries the entire weight of the other section of the furnace assembled on top of it. The outer frame is insulated from the inside of the furnace by a wall of heat insulating brick so as to eliminate any possibility of the outer frame being heated to a temperature which might distort it. The inside of the furnace is built up of cast iron, planished iron, and calorized steel parts, none of which are attacked by a temperature of 1,000° F. or less. 1,000° F. is the temperature at which the furnace is rated. The inner structure is not connected to the outer frame by any through bolts or through metallic parts and it is therefore free to expand in diameter or length without disturbing the outer furnace frame.

The heating element or resistance unit consists of a calorite ribbon approximately 1/3″ wide made up into units of about 20′ lengths, each unit being complete with its insulator and cast iron supporting plate.

Figure 2 shows the heating units assembled and the open door which is usually provided on the lower section of the furnace. This illustration also shows the calorized guard rods which are assembled on a flange in front of the heating units which are provided to prevent the possibility of injury when lowering a gun or forging into the furnace. The calorite ribbon with which the heating unit is wound is a nickel alloy consisting of approximately seventy per cent nickel; twenty per cent chromium and ten per cent iron and can be run at a temperature of 1,800° F. in air without apparent depreciation. The insulators themselves are made from a special alundum compound having great mechanical strength and electrical resistance with the ability to retain both of these properties at a temperature considerably above the operating temperature of the furnace. The insulators with the heating unit have been repeatedly heated to a temperature of 1,300° C. and quenched in oil or water without crazing. This latter feature is of the utmost importance as in a shrink pit an accident is liable to happen which might flood the bottom of the furnace with water.

The top section of the furnace is provided with a split cover, the halves of which move aside to allow the forging to enter or emerge from the furnace. This feature permits the suspension of a gun or forging from a fixture provided with a suspending shaft extending through the center of the cover and supported on I-beam girders on the outside of the furnace. These girders are on rollers and can be moved out of the way when not required. The heating units being located on the inside of the furnace, the heat will be transferred from them to the charge largely by direct radiation. The heating units operate at a comparatively low temperature (only 100° to 200° above the temperature of the charge) as compared to that of the baffle oil type furnace in which the charge must be first heated through the walls of the baffle. The heating unit is located far enough away from the walls of the furnace so that it can readily dissipate its heat and, being of such small cross-section, heats very rapidly. The fact that the furnace is made in sections permits it to be readily assembled or disassembled to any desired height by simply adding or removing sections.

Sets of heating units are connected to each phase of a 3-phase circuit so that two or more sections of the heating unit constitute a polyphase unit which gives a balanced load on the power circuit. One of the outstanding

features of the control is that it permits controlling from the heat unit, which is a body of small mass, and maintaining there just enough temperature to supply the radiation losses of the furnace and gives the required temperature to the charge. This may be called an indirect control and has very marked advantages. One advantage is the arrangement of the contacts whereby the resistor can never reach a temperature sufficient to cause damage to itself, which affords protection against burnouts in case of abnormal voltage; and, which is equally important, no part of the charge can become overheated for the reason that all heat which enters a body must pass through its surface and, as the surface temperature cannot exceed the setting of the instrument, it follows that no part of the charge can be overheated.

The fact that accurate control of the temperature is possible makes this type of furnace very efficient, as it is possible to graduate the temperature from end to end as required for the different thickness of the forging. The absence of noise, heat, smoke and products of combustion, with the ability to locate the furnace in any part of the shop, are great advantages which can be obtained when using this equipment. The necessity of the transportation and storing of fuel oil is also eliminated. It is found that at present the electric furnace can be operated approximately fifteen per cent cheaper than the oil furnace, this percentage not taking into consideration the maintenance and upkeep of oil storage facilities.—*Army Ordnance,* July–August, 1922.

RADIO AND NAVIGATION

New Radio Equipment for Lakehurst.—The two largest airships in the world, now building for the Navy, one at Lakehurst, N. J., and one in Friederichshafen, Germany, will have the latest and best radio equipment capable of development. Anticipating their completion, their home port is being fitted up for their arrival with a high-powered radio station.

A new type of radio transmitting antenna without towers has just been installed at the naval airship base at Lakehurst, N. J., Naval Radio Station NEL. In an effort to keep the big landing field clear for the two big rigids *ZR 1* and *ZR 3*, and to eliminate high towers and aerials, the radio engineers of the Navy designed a long low aerial. It is nearly 800 feet long and fully 120 feet wide, forming a sort of gridiron, which is mounted on poles only 60 feet in height instead of between 150 and 200 feet. Technically it is a multiple-tuned antenna with several ground leads. By erecting the aerial along one side of the field, a clear open space is left for maneuvering the ships.

Recent transmission tests with the new aerial have carried messages on 900 meters to Newport, R. I., and Norfolk, Va., distances approximating 200 and 250 miles, which indicates excellent daytime service. Daytime communication with the big airships when they are cruising within about 300 miles of the station is promised. At present, a vacuum transmitting set with 1 KW in the antenna is used, and the experts believe that on clear nights in winter communication can be carried on with aircraft or ships fully 2,000 miles out on the Atlantic. This will insure the picking up on the German-built *ZR 3*, on her maiden trip to her home port, before she is a third of the way over. When the *R 38* made her initial trans-Atlantic cruise, she was not heard from until within about 600 miles of New York.

The new aerial was designed and built by the Naval Aircraft Radio Laboratory at Anacostia, and installed at Lakehurst by radio men from the Philadelphia Navy Yard.

In addition to the new radio transmitting set, Lakehurst will have a radio compass station which will enable the airships to determine their position in the air within a radius of 200 miles, and locate the field when

returning from a cruise in darkness or in dense fog. Radio equipment for the big rigid ships has not yet been designed, but it is understood that as plenty of room will be available for engine-driven generators producing great transmitting power, a very long range set can be installed, and it is hoped that both radio telegraph and telephone communication can be carried on up to 300 and 100 miles respectively.—*Aviation,* 21 August, 1922.

THE RADIO TELETYPE.—The sending instrument of the teletype is mounted in a standard type of Navy plane. It resembles in general the commercial typewriter. Each key is connected to the radio installation in the plane and when a letter is struck on the keyboard a radio impulse is sent out and is received at a station on the ground. The similarity to the typewriter is completed in the equipment of the receiving end of the device. When, for example, the letter "A" is struck on the keyboard in the air the radioactive energy released travels to the recording instrument and selectively energizes the type-letter "A," causing it to be reproduced on paper carried in the receiver.

The teletype has been in use for eight years in connection with land wire operations, but its application to radio use is a recent development and the present tests now going on at the naval air station are the first that have ever been conducted in aircraft. Within the past year successful tests were carried on with the teletype operated by radio between the naval air station at Anacostia and the Bureau of Standards in Washington, a distance of nine miles. This laid the foundation for further work in connection with airplanes.

As the tests are carried on at present the transmitting instrument of the teletype is mounted in the plane and the receiver is located on the ground at the station, but experts who are carrying on the work point out that a reversal of this operation, where the recording instrument is carried in the plane and messages are sent out to it from the ground stations, is a development merely involving detail.—*Army and Navy Journal,* 12 August, 1922.

RADIO TRANSMITS PHOTOGRAPHS.—The cut shows a reproduction of thumb prints transmitted by radio in ten minutes.—*Boston Evening Transcript,* 22 August, 1922.

LINER "ORBITA" FIRST TO USE LEADER GEAR CABLE.—To the Royal Mail Liner *Orbita* has fallen the distinction of being the first ocean-going

steamer to be navigated into port with the help of the British Admiralty's twenty-mile long submarine cable, which runs from the entrance to the narrow channel leading to Portsmouth well out to sea. The vessel is fitted with the special electrical apparatus necessary for a ship's navigation by such a cable and was guided into port with its aid during foggy weather in the early part of July, while homeward bound from New York to Southampton. By listening to a succession of Morse "V" signals sent over the cable by an operator on shore and steering to port or starboard according as the sounds grew faint or louder, the officer on the liner's bridge was able to steer her safely to her destination although the weather was very thick.

Commenting on this performance of the *Orbita, Shipbuilding and Shipping Record* says that the day may come when the busy traffic of our estuaries may be carried on safely in foggy weather by means of "in" and "out" cables. It is likely to prove a matter of some difficulty to secure the cable against lateral motion in the case of sandy estuaries where silting currents are at work. Having regard to this and other objections, of which the initial and upkeep costs may be mentioned, it seems unlikely for some time to come that this method of navigation will supplant that time-honored institution, the pilot.—*Nautical Gazette,* 5 August, 1922.

MISCELLANEOUS

DISCUSSION AT INSTITUTE OF POLITICS. Williamstown, Aug. 19.—The five-minute speech made here yesterday in regard to the Washington Conference by Rear Admiral W. L. Rodgers, chairman of the executive committee of the General Board of the United States Navy, stands forth in the minds of many members of the Institute of Politics today as one of the most dramatic episodes which has yet developed during the Institute's entire session. By singling out the admiral's comment for special attention, I in no wise intend to disparage the interest of any other address made at yesterday's meeting of the round table on "Problems of the Pacific." The prospects which the Washington treaty have opened in the future were assessed ably by the leader of the round table, Professor George H. Blakeslee of Clark University, and its achievements were challenged as forcefully by Oscar T. Crosby, eminent engineer and formerly Assistant Secretary of the Treasury. The fact remains, however, that as Admiral Rodgers threw the great weight of his professional authority, now into the scales, with Dr. Blakeslee, and now into a balance that fell against the scholar's judgment, from this very process the admiral's speech gained notably in significance.

Mr. Crosby was first to draw the opposition of the General Board's executive leader. "In limiting armament at Washington," Mr. Crosby had said, "the nations of the world gave up only that portion of their naval armament which had ceased to be of vital importance, namely, battleships. The situation," he continued, "suggested an analogy of the knight of old who found his armor too heavy to bear and who lay where he fell, unable to move, while the newly devised methods of the Swiss infantry won the battle sixty yards ahead of him.

"I regret to say therefore that I cannot agree that we have scrapped competition in naval armament, because there is ever with us the inventor. He never sleeps, and after all that has been done regarding the scrapping of dreadnaughts, he is already at work finding means to make weapons which will conform with the Washington agreements and yet be as powerful and as deadly as ever. I have been among the Thibetans, who carried muskets as long as this table, but with the small rifle which I carried I could have shot them down like rabbits. The inventor had been working for me, and he had not been working for them.

"The inventor is working for all the nations in naval armament today, and there has been no 'scrapping' of the competitive principle in the preparation for war, on the contrary, the Washington agreements have left out of the reckoning the very agencies which will be the determining factors in naval warfare of the future."

To this view of the case Admiral Rodgers' opening words came as a categoric negation. "It is the concensus of responsible naval authorities of all the world that the battleship is still the backbone of the fleet, not often used, but holding the ultimate decision."

Here the General Board's opinion evidently went along with Professor Blakeslee's view, expressed in his opening statement to the round table, that the Washington Conference had indeed achieved a substantial international limitation of armament for the first time in history.

Professor Blakeslee's whole address, by the way, was a master-piece of confident and well-expressed definition of the contributions which, after service in the conference as one of the American Government's technical advisers, he believes that the Washington Treaties have made. Paying high tribute to Secretary Hughes, the leader of the round table declared that the Washington Conference "has overthrown British supremacy of the seas and placed on a naval equality the British Empire and the United States. It has strengthened and solidified American-British friendship. It has settled many controversies in the Far East, and placed the others on the road towards settlement."

Upon at least one point of major importance these remarks met dissent from Admiral Rodgers. He said he could not altogether agree with Dr. Blakeslee as to the renunciation of naval supremacy by Great Britain. "Until the United States has a merchant fleet of its own, carrying its products to all the world, without fear of or reliance upon foreign shipping, the British position upon the high seas will be unrivaled in peace and war," the admiral declared.

But the text of the first public pronouncement which the chairman of the executive committee of the General Board of the United States Navy has made upon the subjects in question, since he sat throughout the Washington Conference at the elbow of the American Secretary of State, is worth giving in full.

"It is the consensus of responsible naval authorities of all the world," said Admiral Rodgers, "that the battleship is still the backbone of the fleet, not often used, but holding the ultimate decision. It is not a finished product of invention but still capable of improvement within the limitations of the treaty. To use an army analogy, in the army the infantry arm is the queen of battles to which all other arms are indispensable but still secondary. So with the battleship it is the ultimate arbiter of naval war when and if duly supported by all auxiliary naval types of shipping, including aircraft.

"As to the Washington Conference—at that conference the United States made all the material sacrifices in strength. We hoped in reward, therefore, to gain corresponding advantage in the moral imponderables. While it is now certain as to what we sacrificed, what we hope we have gained lies in the future. We shall not know for ten years. As Mr. Lodge said in the Senate, it is a great experiment, the imponderables of the future, on which we have based our experiment were not worthy of confidence before the war. Before the war the world did not estimate highly the idealism of the potential strength of the United States.

"The United States was inclined to be very civil and forbearing internationally, and other Powers thought they might presume on our forbearance. But the war let the world know that the United States was great and powerful and her anger when aroused was terrible; we appreciate, too, our own economic strength and we appreciate, too, the

economic weakness of Japan as well as her change of front which we have so eloquently put before us, as originated in the ministry of Mr. Hara and continued by Baron Kato who made himself regarded with so much personal esteem and sympathetic feeling in Washington.

"These are the imponderables which justify our sacrifice of material naval strength.

"But we must not sacrifice a full measure of material naval strength as our first line of defense behind which we may develop our potential force in the actual force to make righteousness prevail. Mr. Roosevelt urged that we 'go softly and carry a big stick.' We did carry a big stick in the war and swung it easily, and the world knows it. Henceforth, we may carry a stick, less than the biggest, because the world knows we can swing the biggest and will do so if occasion arises. And so our limitation of naval armament is justified but, as Mr. Hughes pointed out, the conference was to limit only, not to abolish armaments.

"As for our chairman's remarks to the renunciation of naval supremacy by Great Britain, hitherto mistress of the seas, I do not think I can altogether agree with him. The absolute terms of the treaty so far as they go, look to equality; but the naval strength in certain types of ships remains open as before. We may fairly expect the spirit of the treaty to prevail to cause the cessation of competitive building in these types also. But in its merchant fleet the British fleet with its business support, as yet remains unapproachable.

"As the world develops in industry and transportation and as industries specialize regionally, ocean transportation as a basis of national wealth and power increases. Naval combatant strength exists chiefly, if not solely, to back ocean commerce, to route and control ocean traffic, in war as its duty, in peace strategy, it follows and supports the flag of national commerce.

"The United States is developing more and more every decade its foreign business, and the high standards of living of the American people depend more and more upon uninterrupted ocean traffic. It is by its combination of naval strength with merchant shipping strength that England has arrived at its dominant position as a world power. Until the United States has a merchant fleet of its own, carrying its products to all the world, without fear of or reliance upon foreign shipping, the British position upon the high seas will be unrivaled in peace and war.

"The open door, spoken of so often at this institute, in the past month and in so many forums, should be utilized by United States carriers by shipping for men and goods, and by cables, radio and mails for news and business."—*Boston Evening Transcript,* 19 August, 1922.

EUROPEAN NAVAL NOTES.—There is a very pretty row going on in the British Government as to the future of naval flying. Admiral Beatty and Lord Lee are voicing the opinion of the service when they insist that the Navy shall have its own aeroplanes and flying men, but the Treasury is standing out in the matter, apparently on the ground that if the price of an air service is added to the two capital ships which are to be laid down early next year it will make the estimates of the three services appear unequal and folk will be imagining that the Navy is being unduly favored at the expense of the Army and Air Force.

There are two main points on which the Navy objects to being under the thumb of the Royal Air Force, and as they are material and personnel it does not leave much room for satisfaction. As regards the supply of material, one has only to turn up the history of the days when the Ordnance Board supplied both the Army and the Navy with artillery, to find an exact parallel, and no more melancholy chapter in the history

of our fighting forces exists. As to the present condition, figures were officially published which gave the number of each type of machine allotted to the navy, and it was at once seen that they had practically none at all. Then the Air Force published other figures to show that there were really ever so many more ready for naval use, although the Admiralty apparently knew nothing about them. The poor general public is now wondering just where it stands and who is pulling its foot over the figures.

As for the personnel side, the issue is quite straight-forward and will appeal to every sailorman. At one time there was a Royal Naval Air Service, but that was swept away during the war and officers and mechanics of the Royal Air Force appointed to H. M. ships. Then the trouble soon began. The two forces had totally different traditions and ways, and there was nothing but friction forward and aft. Now the navy has landed practically all its aeroplanes from the men-o'-war in order to be free of the trouble, which threatened to become really dangerous to the efficiency of the ships. There is bound to be something of this sort whenever men who are not of the navy are crowded into the cramped spaces of a man-o'-war and placed under naval discipline with reservations. Several young flying men who were inclined to be fresh caused a lot of bother by playing off one service against the other when it came to matters of discipline and work, and there is still the old outstanding sore that they refuse to do ship's duty when embarked, and are backed up in that attitude by their superiors. Thus it happens that the wardroom of a ship that carries R. A. F. men is in a constant state of irritation because there are one or two members of the mess who have nothing better to do for the greater part of the day but drink gin and bitters. And when it comes to naval air work, they are not really fit for the job, because, not being watchkeepers, not all of them know the sharp end of a ship from the blunt, and most of them would be very hard put to it to distinguish between the various classes and lines of merchantmen. What the fleet wants is a flying officer who will revert to ship's duties as soon as his flying life is over and an engine room artificer who shall be as efficient as his class and leave the service with a string added to his bow in the search for civil employment.

To get on to more serious topics, the bombing experiments on the obsolete battleship *Agamemnon* have taken place and have given rather interesting results. They were not intended in any way to show the power of aeroplanes to destroy men-of-war, merely to demonstrate the ability of the airmen to hit the target. Nine-pound smoke bombs were used, which showed up clearly whenever they hit anything, whether it was the ship or the sea. The battleship was fitted with oil fuel so that she could maintain steam without any crew, and was steered by wireless from a destroyer about three thousand yards away. She could be whacked up to fifteen knots without the least difficulty and twisted and turned about in all directions, but practically the whole day was spent ambling along at an easy ten and steering practically a straight course.

Considering that there were a lot of press men and politicians watching the experiments, among whom there is a very distinct tendency to say that the battleship is doomed and that the authorities are criminally foolish to lay down the two new battle cruisers, it is very difficult to see what was the idea of the Admiralty in making the tests so ridiculously easy for the airmen when they had the power to make it approximate somewhat to the conditions that would obtain in wartime. Possibly to spare their feelings. Now we are flooded with well-meaning people who do not know the sharp end of a battleship from the blunt, but who insist on telling us how the navy ought to be scrapped. As a proof of their theories they quote the *Agamemnon* experiments and treat them as final,

with the result that the Admiralty has doubled the difficulties in its path of following the policy to which it has set its hand and which is certainly the best for the country. However, the harm is done now.

The experiments themselves were quite interesting as far as they went, but, needless to say they only touched on the fringe of the problem and must be followed by many more—without an audience. At 8,000 feet four *de Haviland* machines dropped a total of ninety-six bombs, of which two appear to have hit the target and one to have been a little doubtful. The percentage of hits is not high, and when one converts the nine-pounder bombs into missiles of sufficient weight to do much damage to a man-of-war it means that to score those three hits a big air squadron and a huge base organization would be necessary. Had the ship been zigzagging at twenty-five or thirty knots instead of ambling along a straight course at ten, it is difficult to guess what the percentage of hits might have been. Then four small *Snipes* got in and descending to very little over the ships' trucks dropped forty-eight bombs in all, scoring hits with all but three. This was all very well as far as hitting was concerned, but what of the aeroplanes if the target had a crew on board with anti-aircraft and machine guns? Then a flight of *Camels* swooped down and peppered the *Agamemnon's* decks with machine gun fire in a way that must have made them very uncomfortable and proves the necessity of shields for the anti-aircraft armament. After that the range was increased to eight thousand feet again, at which three *de-Havilands* scored five hits out of seventy-two and two *Handley-Page* machines scored a single one with sixty-four bombs. Altogether one cannot help thinking that the war at sea would have been almost comfortable had the proportion of hits to misses always been as low as that.

Even closing one's eyes to the fact that the pilots had been through a special intensive course of bomb-dropping and even with everything in their favor could do better than that, it remains to be asked what harm so few hits are likely to cause a well-protected ship. At Jutland our capital ships stood many more big shells, and the experiments which the United States Navy carried out all suggest that a bomb is not such a dangerous missile as a shell. But the conditions having been made very easy and the airmen having contrived to score a few hits, there are many laymen who are quite satisfied in their own minds that the battleship is doomed. As all these good people have votes there is more trouble ahead of the Admiralty to convince them that the Board is not sticking to the big surface ship merely for the sake of keeping themselves in jobs. —F. C. Bowan, Late Captain Royal Marine, in *Our Navy*, 20 August, 1922.

SCRAPPING OF SHIPS BY ENGLAND AND JAPAN. London, Aug. 23.—Great Britain is scrapping her capital ships "gradually."

Many people have had visions of dockyards, swarming with workers, dismantling the great gray ships alongside the quays, battering off guns and searchlight platforms, as if nothing else on earth mattered.

In England, at any rate, this is far from fact.

In the first place most of the heavy scrapping to be done by England, Admiralty officials showed, is not scheduled before 1925, when four super-dreadnaughts of the *King George V.* type come under the shipbreakers' hammer, or are sold, minus their armament and implements of warfare.

After that the famous *Queen Elizabeth* comes up for destruction in 1035, the *Royal Soverign* in 1936, the *Renown* (already on the reserve list since the return of the Prince of Wales from his world tour) in 1940, and the famous *Hood* in 1941.

In the meantime sixteen obsolete vessels have gone to the scrap heap. They are the pre-dreadnaughts *Mars, Cæsar, Queen Swiftsure, Hindustan, Lord Nelson,* and the dreadnaughts *Bellerophon, Temeraire, St.*

Vincent, Dreadnaught (the original of her type), *Hercules, Inflexible, Indomitable, Crescent* and *Commonwealth.*

These ships, it is true, were partly scheduled for the scrap heap before the Washington Conference took place. The Treaty of Washington sealed their fate and they have accordingly been "scrapped." That is to say, they are no longer on the actual list of the navy.

Some of them have been broken up, others used as targets, others again, minus their guns, rest in the dry docks of Devonport and Portsmouth, rotting gradually with but a couple of caretakers on board—ships which were once the pride of the British fleet.

Of the latter types scheduled to go, and already off the navy's active list, are the *Superb*—in a few weeks to become a target for the bombs of British air squadrons—the *Erin,* already in the hands of shipbreakers; the *Agincourt, New Zealand, Princess Royal* and *Lion.—Baltimore Evening Sun,* 23 August, 1922.

London, Aug. 31—In accordance with the Washington naval agreement, the Admiralty has ordered six large capital ships scrapped. They are: battlecruisers, *Lion* and *Princess Royal,* sister ships, built in 1910 and 1911. Both are 675 feet long, displace 26,350 tons, and carry eight 13.5-inch and sixteen 4-inch guns. The *Lion* in 1911 smashed all speed records when she steamed 31.5 knots during an eight-hour full-power trial. The dreadnaughts *Orin, Monarch* and *Conquerer* are all of the same type and were finished in 1912. Each is 545 feet long, has a displacement of 22,500 tons, and carries ten 13.5-inch and sixteen 4-inch guns. The dreadnaught *Erin* was finished in 1914 and is 540 feet long, displaces 23,000 tons and carries ten 13.5-inch and sixteen 6-inch guns. All are among the most famous warships in the British Navy.—*Boston Evening Transcript,* 31 August, 1922.

Washington, Aug. 17.—Preparatory operations for carrying into effect provisions of the Washington treaty for limitation of naval armament insofar as they apply to scrapping of vessels, as announced by the Navy Department in Tokio, were made public tonight by the Japanese Embassy. The plans follow:

"1. *Aoki* and *Satsuma* to be transferred to Yokosuka, where they are to be scrapped.

"2. *Katori* and *Kashima* to be sent to Kure, where their turrets are to be landed, and then to come to Maizuru, where they are to be scrapped.

"3. *Kurama* to have her turrets landed at Kure and then to be sent to Sasebo, where she is to be scrapped.

"4. *Ikoma* to have her turrets landed at Yokosuka, and then to be sent to Sasebo, where she is to be scrapped.

"5. Part of operations preparatory to scrapping of war vessels to be scrapped under naval treaty, other than those mentioned in foregoing, to be carried out at naval stations to which they respectively belong.

"6. War vessels, preparatory operations on which, as above-mentioned, have been completed, are to wait for further order until coming into force of naval treaty."—*Baltimore Sun,* 18 August, 1922.

Tokio, Aug. 10.—As soon as the ratifications of the five-power naval treaty drawn at the Washington Arms Conference are exchanged by the United States, Great Britain and Japan, the Japanese Admiralty will put into effect plans already made for scrapping war tonnage under the naval limitation program. An Admiralty official explained that until these three powers take final action, Japan did not feel justified in scrapping a single new ship.

He said, however, that Japan was influenced by what France might be disposed to do.

A strong party here would favor making the five-power treaty a three-power one should France and Italy fail to ratify.

The Admiralty will announce soon the scrapping program. Reports of the vernacular press that the dismantling of the *Kurama* had begun are untrue.

Japan is eager for financial reasoning to carry out the terms of the treaty as quickly as possible. But the Diet has not yet voted money for the purpose.—*Baltimore Sun,* 11 August, 1922.

Washington, Aug. 10.—Although officials of the Washington Government are anxious that the naval limitation treaty shall come into force at the earliest practical moment, they so far have made no plans for an exchange of ratifications until all five of the signatory powers are ready to record formal approval of the pact.

To await action by France and Italy, as well as by Japan and Great Britain, it is pointed out, not only would be in accord with well-established diplomatic practice but would harmonize with the earnest desire for absolute and final consummation of the naval program laid down by the Washington Conference at the instance of the United States.

Three-Power Agreement Cited

Should Japan formally suggest an easier exchange of ratifications by the three powers, who are principals in the 5-5-3 arrangement, however, it is indicated that the proposal would receive careful consideration by State and Navy Department officials. In that connection it is recalled that the American, British and Japanese delegations to the conference agreed that the 5-5-3 ratio should stand as applying to the three powers, regardless of the policies of France and Italy, and it is not doubted that a three-power treaty on the subject would be possible should permanent obstacles block ratification of the five-power arrangement in France or Italy.

Thus far, however, department officials have received no advices which discourage them in their confidence in ultimate ratification by all five of the Washington treaty signatories. It is realized that other questions are agitating official circles in Europe, and it is assumed that in due time the naval pact will be given favorable consideration.

Only the execution of a formal certification by President Harding is necessary to complete ratification of the treaty by the United States, but it has been indicated that this step probably would not be taken until officials at the same time could set a date for exchange of all the ratifications. Meantime the American naval officials, like those in Japan, are making tentative plans to carry the scrapping program into effect.—*Baltimore Sun,* 11 August, 1922.

A SUPERPOWER SYSTEM FOR THE REGION BETWEEN BOSTON AND WASHINGTON.—The signing of the armistice providentially delayed a rapidly approaching power famine in the northeast manufacturing district of the United States. That there is a problem of power shortage to be faced sooner or later in that district, however, as population and industry increase, is indicated by the rapidity with which the development of war industries absorbed the available power.

A survey of the resources and needs of the region has recently been made under the direction of W. S. Murray, and the report has been published as "A Power System for the Region between Boston and Washington," *U. S. Geol. Survey Professional Paper 123.*

The territory in which the survey was made—the "superpower zone"—lies between the thirty-ninth and the forty-fourth parallels of latitude and

extends from the coast to approximately 150 miles inland, including parts of Maine, New Hampshire, Vermont, New York, Pennsylvania, Delaware, and Maryland and all of Massachusetts, Connecticut, Rhode Island, and New Jersey.—*Geographical Record,* July 1922.

HELIUM.—To date no one has succeeded in combining helium with any other element, or in inducing the gas to take part in any chemical reaction under any conditions. In this respect, it is similar to other rare gases of the atmosphere—neon, argon, krypton, and xenon. Helium is only slightly soluble in water. Its thermal conductivity is fairly high, but it is less than that of hydrogen. A volume of helium weighs about twice as much as an equal volume of hydrogen, under identical conditions of temperature and pressure. It is a good conductor of electricity, being next to neon in this respect. Under similar conditions it conducts a current 25 times as readily as air. After overcoming immense difficulties, Professor Kammerlingh Onnes, of the University of Leyden, in 1908, succeeded in liquefying helium. The liquid boils at -268.75° centigrade or 4¼° absolute. Solid helium has not yet been obtained.

The French and British had no dirigibles at the beginning of the war, but later hastened to repair their deficiency. From experience gained in the defense of London and other important points, it was recognized that the dirigible was vulnerable—extremely so, against a well-organized attack. The inflammability of the hydrogen contained in the ship was the one weak point in this method of attack. The remedy for this situation was, of course, to be found in a non-inflammable gas, light enough to replace hydrogen as a lifting force; helium is the only gas known to have these qualities. The use of helium has still other advantages: It diffuses through a fabric at about three-quarters the rate of hydrogen; its non-inflammability makes it possible to place the engines in the framework of the dirigible, thus getting a direct drive, giving greater control of the craft, and much increased speed for any given horsepower.

Early in 1915, word came to an official of the Bureau of Mines that the British were interested in sources of helium for use in dirigibles. When the United States entered the war in 1917, helium for use in dirigibles was discussed among Bureau of Mines' officials, and in June the matter was presented to the Army and Navy Air Services as a war project. These services enthusiastically approved the proposition, and allotments of money were made from the Army and Navy appropriations to carry it forward.

Three experimental plants were constructed in Texas, under the direction of the Bureau of Mines, two at Fort Worth, for economic reasons; one plant used the Linde system of liquefaction, the other the Claude system, and the supply of gas was piped to the plants from Petrolia, Texas. Analysis had shown that this gas contained 95% helium. Another plant was later constructed at Petrolia, near the gas wells, and use was made of a new method of liquefaction, called the Jefferies-Norton process. All three plants produced helium, but the Linde plant proved the most efficient, and it was decided to construct, under the cognizance of the Navy, a much enlarged plant for obtaining helium in greater quantities. The construction of this plant was started in October, 1918; it was completed in December, 1920, and was operated during part of 1921. It produced altogether about 2,000,000 cubic feet of helium, which, with the helium obtained at the smaller plants during the experimental period, makes available at the present time a total of about 2,400,000 cubic feet of helium over 90% in purity. Most of the gas is around 95% grade.

Before the completion of the large plant, the two experimental plants at Fort Worth were shut down and dismantled. The plant at Petrolia, Texas, was continued, however, until July, 1921, on a purely experimental

basis. It was then shut down, and at the present time is being kept in a standby condition.

The method of operation in all of these plants is, in general, the same, although there is considerable difference in detail. The object is to liquefy all of the elements making up the natural gas except the helium, which does not liquefy at the temperature used. After liquefaction of all other constituents in the gas—such as nitrogen, methane, ethane, propane, and butane—the helium can be pumped off. Thus far, helium has been obtained in two stages. One stage in operation gives about 70% purity; this has been refined up to 95%. In the second operation the nitrogen, representing practically all the impurity, is liquefied and the helium is once more pumped off.

No production of helium is now in progress, but funds will probably be furnished by Congress to run the large plant at Forth Worth practically during the whole of next year. Under such conditions, from eight to ten million cubic feet of helium may be obtained.

Two helium repurification plants have been constructed by the Army, and the Bureau of Mines is co-operating in installing the final liquefaction equipment. One of these is at Langley Field, Va. In this is used an expansion engine refrigeration system, with heat interchanges, and an especially designed purifier. This plant will be used for refining helium after it has been used in a balloon or dirigible and has become contaminated with air by interchange through the fabric. When the grade of the gas is reduced to 85%, its lifting power (which is normally 92% that of hydrogen when both gases are 100% pure) is too low for practical use, and the gas must be refined. After being refined, it can be used again.

The other repurification unit has been installed on two railroad cars. One car contains the power plant, and the other the compressors and liquefaction equipment. These can be moved from place to place as needed. The use of charcoal at low temperatures for repurification will be tried in this plant. Charcoal exercises selective action in absorbing air and nitrogen, taking them up freely, whereas helium is scarcely absorbed at all. In this way a separation of helium can be obtained.

Complete equipment for conducting research at low temperatures, the Cryogenic Laboratory of the Bureau of Mines, is located at Washington in the Interior Department building, representing the research department of the whole helium project, and employing a force of 12 men. Fundamental information is being obtained that is essential for the construction of any new plant designed to have greater efficiency than the large plant at Fort Worth. Helium can probably be produced in this plant for ten cents a cubic foot, but it is believed that the cost can, ultimately, be reduced to 3 cents and perhaps to 2 cents. Necessary information is being gradually accumulated to this end.

The Government's entire helium program is now carried on under the general authority of the Army and Navy Helium Board, consisting of a representative, each, of the Army and Navy, together with a delegate from the Bureau of Mines.—*Reports of Investigations,* U. S. Bureau of Mines.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"War-Time Destroyer Program"—Lieutenant Commanders W. C. Owen and John F. Shafroth, Jr., U. S. Navy, in *Journal of the American Society of Naval Engineers,* August, 1922.

"Seagoing Tugs"—Lieutenant Commander H. G. Donald, U. S. Navy, in *Journal of the American Institute of Naval Engineers,* August, 1922.

"Welding; its uses and abuses."—Captain E. R. Jessup, U. S. Navy, in *The Journal of the American Society of Naval Engineers,* August, 1922.

"Tests of a Camellaird-Fullagon marine Diesel Engine" (Illus.)—*The Engineer,* 11 August, 1922.

"The Problem of the Internal Combustion Turbine" (Illus.)—*The Marine Engineer and Naval Architect,* August, 1922.

"German Torpedo Boat Destroyer Building During the War" (Illus.)—*Engineering,* 4 August, 1922.

"Centrifugal Castings" (Illus.)—*Engineering,* 4 August, 1922.

"The Oil Engine of Today"—Dr. Charles E. Lucke, *Power,* 15 August, 1922.

"Care of Valves on Diesel Engines"—*Power,* 8 August, 1922.

"Economy in Electric Lighting on Board Ship"—*Industrial Management,* 10 August, 1922.

"Automatic Train Control"—*Journal of the Franklin Institute,* August, 1922.

"Development of American Rifles"—*Scientific American,* August, 1922.

"The Production of the Mines for the Northern Mine Barrage"—by Commander F. J. Cleary, in *The Journal of the American Society of Naval Engineers,* August, 1922.

"Duncan" Commended Essay on "Deduce from the experience of war, the future of the defense of coast fortresses against attacks by land, sea, and air, during the next ten years"—*Journal of the Royal Artillery,* August, 1922.

"Britain's Future Aerial Navy"—by "Icarus" in *The Fortnightly Review,* August, 1922.

"Our Urgent Need: Air Power"—*The Nineteenth Century,* August, 1922.

"Aircraft Guns II"—*Army Ordnance,* July-August, 1922.

"Organization and Function of Naval Aviation"—*Aviation,* 28 August, 1922.

"U. S. Naval Airship *ZRI*"—*Aviation,* 28 August, 1922.

"Radio-Telegraphy"—by Senator Guglielino Marconi"—*Journal of the American Institute of Electrical Engineers,* August, 1922.

"The Ship Subsidy Bill"—by Albert D. Laskar, *Scientific American,* September, 1922.

"American Marines in Haiti Exonerated: Report of the Senate Committee"—*Current History,* August, 1922.

"Turkey Reinterpreted"—by Rear Admiral C. M. Chester, U. S. Navy, *Current History,* September, 1922.

"What the League of Nations Has Accomplished"—by Arthur Sweetser, *Current History,* September, 1922.

"Increase of Armament in South America"—*Current History,* September, 1922.

"Japan's Movements in Siberia"—*Current History,* September, 1922.

NOTES ON INTERNATIONAL AFFAIRS

FROM AUGUST 5 TO SEPTEMBER 5

PREPARED BY

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GERMAN REPARATIONS

NO DECISION AT LONDON.—The meeting of Allied premiers held in London during the week of August 7-14 failed to reach decision on the question of a delay in German reparations payments. The proposals for further guarantees made by France, including control of German mines and forests and a customs barrier between the occupied territory and the rest of Germany, were disapproved by a committee of experts by a vote of 4 to 1. Without such guarantees Premier Poincaré refused to consent to a moratorium.

REPARATION COMMISSION GRANTS DELAY.—Upon the failure of the London Conference, the question of delayed payments went back to the Reparation Commission. The latter first sent the British and French Commissioners to Berlin for further study of German finances, and then in session in Paris on August 27 called upon Germany for further proposals. Germany offered guaranteed increased deliveries of coal and timber in lieu of cash payments.

Finally on August 31 the Commission announced a decision, based on Belgium's compromise proposals, by which Germany was released from further payments, amounting to about 250,000,000 gold marks, for 1922. Belgium, with priority claims for this amount, agreed to accept six months' Treasury bills instead. The decision regarding a further moratorium was held up pending reforms in German finances. Up to the last France threatened independent action against Germany, Premier Poincaré consenting to the commission's decision only upon realization that an independent course on the part of France would destroy Allied solidarity and virtually tear up the Versailles Treaty. The text of the decision follows:

The Reparation Commission, after examining the new request for a moratorium, dated July 12, 1922, and taking into account the fact that the German State has lost its credit, both internal and external, and that the mark has depreciated continuously down to three one-thousandth of its normal value, decides:

Firstly—to defer its decision on the request of the German Government until the Commission has completed its scheme for the radical reform of German public finances, including:

(a) Balancing of the budget;
(b) In the event of the Governments represented on the Reparation Commission giving their prior consent thereto, reduction of Germany's foreign obligations insofar as may be considered necessary for the restoration of her credit;
(c) Currency reform;
(d) The issue of foreign and internal loans in order to consolidate the financial situation.

Secondly—With a view to giving time for reparations and the carrying out of the measures referred to under paragraph 1 above, the commission agrees to accept in payment of the cash installments falling due August 15 and September 15, and, unless in the meantime other arrangements are made, of the further cash installments falling due between October 15 and December 31, 1922, German Government six months' Treasury bills, payable in gold and guaranteed in such manner as may be agreed upon between the German Government and the Government of Belgium (to which Power the payments have been assigned), or, in default of such agreement, by the deposit of gold in a foreign bank approved by Belgium.

PRE-WAR DEBT PAYMENTS.—On August 18 a joint Allied note was sent to the German Government stating the decision of Allied experts regarding payments by Germany on pre-war debts owed by German nationals to Allied nationals. The decision was that Germany must pay within one month the £2,000,000 due on August 15, but that thereafter the various Governments should make separate arrangements with Germany subject to the approval of the Reparation Commission.

On August 27 it was reported that a settlement with France was in prospect, and that the French reprisal measures against Germans in Alsace would be suspended.

FRENCH DEBT MISSION TO AMERICA RECALLED.—On August 17 Premier Poincaré ordered the French Debt Commission in the United States, headed by M. Jean V. Parmentier, to return to Paris. M. Parmentier was empowered only to lay the French financial situation before the U. S. Refunding Commission, and apparently also to show that France could not pay her debt to America unless Germany fulfilled her obligations to France. The recall, however, was not regarded as an interruption in negotiations, which would be renewed after further decision in the matter of German payments.

GERMAN-AMERICAN CLAIMS SETTLEMENT. Washington, August 10.—The signing in Berlin today of an agreement between representatives of the United States and Germany for the determination of the amount of American claims against Germany was announced this evening by Secretary Hughes.

The agreement provides for a mixed claims commission of two commissioners, one to be named by the United States and the other by the German Government with an umpire to settle matters on which the commissioners cannot agree.

President Harding today named William R. Day, Associate Justice of the United State Supreme Court as umpire acting upon the expressed desire to have an American citizen appointed.

There appears to be no intention on the part of the Administration to make the operation of the agreement contingent upon ratification by the Senate. The agreement, in fact, itself provides that it shall "come into force on the date of its signature."
The commissioners meet at Washington within two months after the coming into force of the agreement.

IRELAND

DEATH OF IRISH LEADER.—Arthur Griffith, founder of the Sinn Fein movement, president of the Dail Eireann Cabinet, and leader of the Free State party in Ireland, died on August 12 from the effects of a slight operation for tonsillitis aggravated by a general breakdown in health. Griffith's death was a serious loss to the cause of the Free State and the Anglo-Irish Treaty. He was buried on August 16 in Glasnevin Cemetery, the burial place of Daniel O'Connell and other Irish patriots.

Ten days after Griffith's death, on August 22, Michael Collins was killed in an attack upon his party by rebel forces near Cork. Collins had left Cork and was proceeding southward to inspect military positions when his party in automobiles was ambushed. Collins was commander-in-chief of the National Irish Army, finance minister in the Dail Eireann Cabinet, and after Griffith's death head of the Irish State. Upon Collins' death William T. Cosgrave, who with Collins and Griffith was one of the signers of the Anglo-Irish Treaty, became head of the Government until the meeting of the Dail Eireann Parliament on September 9. Richard Mulcahy was made commander-in-chief of the Free State army.

During August the republican forces in Ireland were driven from Cork and other strongholds and almost reduced to guerilla warfare. With the capture of Waterville on the Kerry coast, on September 3, five of the cables which for three weeks had been held by the rebels, were released.

AUSTRIA

GOVERNMENT SEEKS FOREIGN SUPPORT.—The Austrian government at the close of August undertook a policy of sounding her territorial neighbors with a view to economic assistance, Chancellor Seipel in turn visited Prague, Berlin, and Rome with a warning that Austria's collapse was at hand and that parts of her territory were likely to break away or be seized by other states unless support were forthcoming.

There were reports of economic alliance between Austria and the Little Entente, and on the other hand of an understanding between Italy and Austria. Italy indicated that she was unalterably opposed to any union of Austria and other Danube states, in accordance with the French policy of building up a Central European Confederation against Germany. Such a confederation, with Jugo-Slavia included, would also be anti-Italian. In a note to the powers, Italy stated that Austria's union with Germany or entry into the Little Entente would be regarded as a *casus belli.*

Austria's difficulties will come before the League of Nations Assembly in September. At a meeting of the League Council on August 31, it was decided that a report by a finance committee would be necessary before a decision could be taken in the matter of lending aid.

RUSSIA

MILITARY CLAUSES IN RUSSO-GERMAN TREATY.—From Constantinople on August 21 came a report of the revelation of military clauses in the Russo-German Treaty of Rapallo, despite the denials of the Russian and German foreign offices. The report cites a document issued by Karl Radek outlining five concessions to Germans in the Ukraine and Caucasus, involving extensive colonization by German reservists. These concessions, according to Radek, are recompense for "Germany's vast military and economic aid, which we already begin to receive."

PROPOSED AMERICAN COMMISSION TO RUSSIA.—The U. S. State Department on August 30 announced that through Ambassador Houghton at Berlin informal inquiries had been made as to the attitude of the Soviet authorities should the United States consider sending an expert technical commission to study the economic situation in Russia.

Nothing was done in the matter after the Russian reply. This was in effect that the commission would be received only on a reciprocal basis, i. e., on condition that Russia be allowed to send a commission to America.

NEAR EAST

ENVER PASHA REPORTED SLAIN.—According to a Moscow despatch of August 16, Enver Pasha was killed in Bokhara on August 4 in a cavalry attack on Soviet troops.

Enver Pasha was one of the leaders of the young Turks who dethroned Abdul Hamid. He was chief of staff of the Turkish Army in 1913-14 and chiefly blamed for Turkey's entry into the war on the side of Germany. After the war Enver fled from Turkey and was engaged in intrigues with the Soviets, who later accused him of treachery. His last effort was to become Emir of Turkestan.

TURCO GREEK PEACE PROPOSALS.—London, August 21.—A joint invitation will, it is expected, be dispatched in ten days or a fortnight by Great Britain, France, and Italy to Greece and both Constantinople and Angora Turks to attend the conference to be held at Venice on the Near Eastern situation. The conference was suggested by the three Allied High Commissioners at Constantinople, Sir Horace Rumbold, General Vellé and Maruis Garroni, and has been agreed to by the Allied Governments.

The object of the conference is not to make definite peace, but to propose ground for a full-fledged peace conference. The Allies will insist that a declaration of armistice shall be one of the conditions imposed and will not listen to the Angora demand for the evacuation of Asia Minor by the Greeks before the conference comes together.

The basis of the conference will be proposals for a settlement of the Near East situation made in March by the allied foreign Ministers at Paris. These included the retirement of Greece from Smyrna, the with-

drawal of the allied troops from Constantinople to the Gallipoli Peninsula, and the demilitarization of zones between European Turkey and Grecian Thrace along the southern shore of the Dardanelles.

Representatives of the International Red Cross, which is to inquire into the alleged massacres of Greeks in Asia Minor, arrived at Constantinople last week and are now awaiting word from Angora as to how far they will be permitted to go in making their investigations. The question of who is to provide the funds for their expenses has also been raised.—*New York Times.*

RENEWED TURKISH OFFENSIVE.—On August 4, the Greek Government in a note agreed to relinquish its designs against Constantinople in view of the attitude of the Allied powers.

While the Greek forces were weakened by the concentration in Thrace, the Turkish Nationalists on August 27 took the offensive in Asia Minor, and on that date captured Afium Karahissar, an important strategic point at the junction of the Smyrna branch and the main line of the Bagdad railway.

FAR EAST

UNION OF PEKING AND CANTON LEADERS.—On August 10 Sun Yat-sen, after the defeat of his forces by General Chen-Chiung-ming, left his cruiser in Canton Harbor and went to Shanghai aboard a British gunboat. Subsequently it was reported that Sun was in friendly negotiations with President Li Yuan-hung in Peking and would probably go north in person. General Wu Pei-fu, chief sponsor of the northern government, on August 21 endorsed Sun's proposals for a parliament free from outside influences, self-government of the provinces in place of the Tuchun or military governorship system, and conversion of the provincial armies into labor battalions.

In the meantime the Peking Government was reported in serious difficulties owing to the defiance of military leaders, lack of funds to pay civil employees and army, dissension in parliament between northern and southern groups, and renewed operations of the Manchurian rebels under General Chang Tso-lin.

UNITED STATES AND LATIN AMERICA

SECRETARY HUGHES AT BRAZIL CENTENNIAL.—Secretary of State Hughes sailed from New York on August 25 as head of the special American mission to the Brazil Centennial celebration at Rio de Janeiro. Secretary Hughes' visit recalled the coming of Emperor Don Pedro of Brazil to America at the time of the American Centennial in 1876.

INTERNATIONAL PROBLEMS

RATIFICATION OF ARMS TREATIES. London, August 1.—Formal ratification of the Washington armament treaties by Great Britain was completed today and copies of them signed by King George will be sent to Sir Auckland Geddes at Washington in the diplomatic bag by the next steamship.

The ratification has taken some months because it was necessary to obtain the formal assent of the Dominion governments and action by the Dominion parliaments to make the terms of the agreements affective.

Tokio, August 10 (Associated Press).—As soon as ratifications of the Washington Arms Conference are exchanged by the United States, Great Britain, and Japan, the Japanese Admiralty will put into effect plans already made for scrapping war tonnage under the naval limitation program.

An Admiralty official explained that until these three powers took final action, Japan did not feel justified in scrapping a single new ship. He said, however, that Japan was uninfluenced by what France might be disposed to do.

A strong party here would favor making the five-power treaty a three-power one should France and Italy fail to ratify.

Washington, August 10 (Associated Press).—Although officials of the Washington Government are anxious that the Naval Limitation Treaty shall come into force at the earliest practicable moment, they have made no plans for an exchange of ratification until all five of the signatory powers are ready to record formal approval.

To await action by France and Italy, as well as by Japan and Great Britain, it is pointed out, not only would be in accord with the earnest desire here for consummation of the naval program laid down by the Washington Conference at the instance of the United States.

Should Japan formally suggest an earlier exchange of ratifications by the three powers which are principals in the 5-5-3 arrangement, it is indicated that the proposal would receive careful consideration by State and Navy Department officials. In that connection it is recalled that the American, British, and Japanese delegations to the conference agreed that the 5-5-3 ratio should stand as applying to the three powers regardless of the policies of France and Italy, and it is not doubted that a three-power treaty on the subject would be possible should permanent obstacles block ratification of the five-power arrangement by France or Italy.—*New York Times,* November 8.

MEETING OF LEAGUE OF NATIONS ASSEMBLY. Geneva, August 18 (Associated Press).—South America probably will play the leading rôle at the third assembly of the League of Nations, which opens here on September 4, in consequence of the numbers of questions of world-wide importance which have been placed before the League by the South American members.

A formal application from Hungary for membership in the League has been received and will be acted on at the September meeting.

Among the questions which South American members have placed before the League are Uruguay's proposals for an American League of Nations within the League, the extension of the Washington naval accord to all other naval powers, which would include a number of South American powers, and the relation of the forthcoming Santiago (Chile) conference to the League and its plan for world disarmament.

So important a place does South America occupy on the program of the third assembly that a movement has been started to elect a South American president of the body. Augustin Edwards, Chilean minister to Great Britain, who took such a prominent part in the last assembly, is prominently mentioned for the post.

CONTROL OF CABLES. Williamstown, Mass., August 15.—The Institute of Politics centered its interest today on the discussion at the Round

Table on International Electrical Communications Service, where Walter S. Rogers, American delegate to the International Communications Conference in 1920, reminded the institute of other post-war problems, still unsettled, in which the American viewpoint had encountered an obstinate resistance.

It was not till America entered the war, according to Mr. Rogers, that Great Britain diverted the German cable hitherto connecting the Azores with New York so that it now runs into Halifax and forms a part of the "British All-Red Cable Route" to the Pacific. The American peace envoys, he said, contended in vain that this was a diversion and interference, not alone with German property, but with the communications route on which the cable life of the United States depended.

In the round table conference Great Britain's practical domination of the world cable routes was shown, as well as the total lack of an independent cable system belonging to America.

Mr. Rogers discussed the political, commercial and military significance of telegraphs, cables, and radio, and some of the national and commercial rivalries growing out of efforts to obtain and control monopolies. He traced the maneuvers which long delayed the efforts of the Germans to utilize the Azores as a relay station for cables to the United States. Referring to the pre-war interruption to cables touching Ireland, he urged the necessity for more cables between the United States and the Azores as an alternative route and as freeing the United States from dependence upon Great Britain for cable landings.

Would Have the Azores Free

"While the British monopolistic concession at the Azores had expired," said Mr. Rogers, "the Portuguese Government hesitates to grant landing rights to American companies, probably because of influence brought to bear by the British cable companies, who look askance at the United States gaining greater cable freedom. In order to permit a wide extension of American cable contacts every effort should be made to make the Azores easily available and free from possible interference by foreign companies or third governments for cable relay purposes, the Azores being ideally located for becoming a great cable center, with cables radiating to various places in Europe, Africa, South and North America.

"The Azores should virtually be internationalized as a cable center and the powers by treaty obligated, even in time of war, not to seize control of the cables landed there. Portugal would gain through the interesting of other powers in maintaining the political *status quo* of the islands, and because the commerce of the Azores would be aided and tax receipts increased."

At the outset of the war, Mr. Rogers said, Germany had the best radio system and Great Britain the best cable system because of the virtual British world domination. He indicated how this had been built up in detail, and attributed British control largely to the fact that all cables always had been made in Great Britain and sold "laid," as he termed it. In this way the British Admiralty had been able to get full information as to the location of cables all over the world."

In showing the dexterity of the laying of cables with a view to their possible interruption in war, he said that sometimes dummy cables are laid, as, for instance, was the case in the Indian Ocean, where the Germans had cut a cable and no interruption was accomplished. It was the British policy, Mr. Rogers said, to develop cables only that would touch British points. He explained the great centering of cables in London and attributed London commercial supremacy largely to that fact.

Mr. Rogers then went into a discussion of the commercial advantages of cables. He instanced the indispensability to shipping of good cable

communications, although ships now were more directly dependent on radio. But always in freighter service, he said, a captain would go to some port and discharge his cargo and await cable instructions, and possibly not return to England for several years. The political importance of electrical services he showed particularly by explaining the links of such services that connected up the entire British Empire.

Commenting on Mr. Rogers' remarks at the Institute of Politics, President Carlton of the Western Union Telegraph Company declared that inadequate American cable communications were due to slow action by the Government. "Apparently Mr. Rogers thinks there is no United States cable policy," said Mr. Carlton. "If he means no government policy, I cordially agree. Whether Mr. Rogers is speaking as an individual or as an employee of the State Department, he knows that the Western Union Telegraph Company has been applying for more than a year for permission to extend its cable system to Northern and Southern Europe, South America, Japan and China.

"So far, and despite almost daily efforts on our part, the State Department has failed to act. Mr. Rogers should know that in 1918 a comprehensive plan of cable extensions was laid before the Government and urged upon Congress. This plan, in brief, contemplated cables to Northern Europe, Southern Europe, Russia, Japan, China and the east and west coasts of South America.

"The plan also proposed a more effective distribution of the present concentrated cable facilities now terminating in Great Britain. Mr. Rogers is apparently unaware of this program. It can be fairly said that before Mr. Rogers can effectively develop interest in what he has called a United States cable program, it will be necessary for him to agitate revision of the procedure of his own, the State Department. Cable expansions can only be made by encouraging private enterprise.

"Private enterprise is not encouraged if the machinery of government is ineffective, slow and unbusinesslike, resulting in a year's delay in obtaining the simple right to land and operate a cable about which there is no dispute.

"Mr. Rogers says the British are pre-eminent in the cable business. They are, and it is interesting to contrast the methods that prevail in Great Britain in dealing with cable extension and the methods that prevail in this country. Recently we had occasion to apply to the British Government for right to land a cable. Within twenty-four hours we had the right. Recently we also applied to the Canadian Government for a right to land three cables. This was granted within a few hours. Mr. Roger's department has been considering our applications for cable landings since June, 1921, and we have not heard yet what they are going to do.

"In fine, it is idle to talk about expanding cables or a cable plan so long as the companies are subjected to the delays of the State Department under the operation of the Kellogg act."—*New York Times,* December 8.

REVIEW OF BOOKS

THE LITERATURE OF PEACE, by Col. S. C. Vestal, C. A. C.

If the vagrant will of the Nations' Man has been chained by the League of Nations and the Washington Conference for the Limitation of Armaments, we are at the beginning of a great new world epoch and Vestal's *Maintenance of Peace* is justified.

As that interesting volume has played an important part in shaping diplomatic thought toward the great ends achieved, it is interesting to compare the author's deductions from political and military history with the actualities as they appear to be unfolding before us in the march of world events.

But, first, let us recall the identity of the author.

In 1895, Samuel C. Vestal was graduated, high in his class, from the U. S. Naval Academy. Shortly thereafter he resigned from the navy and enlisted as a private in the army. In those days it was a long, tedious road from private to subaltern, but it was the ideal way, under the circumstances, for, after having been an officer, he could fully appreciate the side lights of the enlisted point of view. Vestal had the courage and patient determination to follow that course. He is a colonel in the army now and a member of the faculty of the Army War College, the apex of the United States military educational system. Besides a wealth of experience as a practical soldier, including the command of a field artillery regiment in France during the World War, he has been a relentless student of history for a quarter of a century.

Thus he estimates his problem of peace from several excellent points of view: from that of the sailor educated by way of the refined academic route; from that of the soldier educated by way of the hard knocks of actual service; from that of the student of history and of the science of war; from that of an important participant in a great modern international conflict.

If the *Maintenance of Peace* is destined to become a classic, it will carry with it down through the centuries of posterity some twenty of the author's hard-working years devoted to its preparation.

Colonel Vestal takes the problem of peace as he would take any real problem and estimates its possibilities as a problem in power, quoting Pascal's, "You must combine justice and power, making what is just strong, and what is strong just."

He maintains, and proves by historical precedent, that even if states could be assured of immunity from foreign aggression it still would be necessary to support large armaments. "The existence of domestic peace in any country," he says, "is due to the fact that men interested in the

welfare of the country have the means to enforce order at any moment that it may be disturbed."

Increase of armed forces always has been necessary after revolutions to meet counter-revolutions. Examples: Cromwell's unexcelled army followed the few household troops of Charles I; the vast armies of the Republic, Consulate, and Empire, followed the small army of Louis XVI; the great republican army of Yuan-Ski-Kai after the inefficient army of the Manchus. The United States needed an army of nearly a million men and a navy of six hundred vessels to restore domestic tranquility.

"There is an innate desire in the hearts of every people to extend its frontiers to the limits of the island or continent or habitable district which it occupies, in order to extend its area of domestic peace and put an end to foreign wars."

The maintenance of the balance of power in its widest concept is the author's certain guaranty of world peace.

"The joint resistance of several nations to Caesarism, or the domination of a single nation, is designated as the maintenance of the balance of power." A desirable status of balance of power does not imply, it is explained, an equipoise in power but rather a preponderance. An equipoise, such as existed between the European Triple Alliance and the Triple Entente, increased the hazard. The perfection of balance of power is found in the American Union whereby the several states are so adequately guaranteed against attack by any other state.

"Superior military preparation on the part of the many who desire peace, coupled with willingness to fight, if necessary, is the only means yet devised to avoid the horrors of war."

Peace can be maintained only through maintenance of the balance of power, and the balance of power can be secured only by preparation for the fight.

If the balance of power is ever overthrown on the European-Asiatic continent, the rest of the world will wear the chains of servitude to the successful world conqueror.

The important observation, not previously appreciated by military students nor sufficiently emphasized by military writers, is made that the modern world has been saved from the domination of the single nation by the fortunate fact that the strongest military state never has been at the same time the strongest naval power; i. e., because the command of the land and command of the sea never have been in one nation at the same time. No nation can establish universal rule until it achieves a great conquering army and a fleet powerful enough to dispute seriously the command of the sea. Sea power has been the salvation of the weaker states as against powerful military neighbors.

In this connection it is urged as most important that sea power never should be emasculated by *exempting private property from capture at sea.*

The maintenance of the balance of power is shown clearly to be the policy of mutual guaranty of territorial integrity and independence. Therein, the author believes, lies the only hope of peace—at best a

voluntary union of free commonwealths whose continued existence has a shadowy, uncertain guaranty. A definite union of independent states to preserve peace would amount to either federation or confederation. Federation would mean a world power wherein the central control would legislate for the individuals of the nations of the world, or a world tyranny such as Germany recently sought to impose. Confederation, on the other hand, has been demonstrated as ineffective government because such central control has to legislate for states over which it has no power (other than the pressure of war) to impose its decrees. In a federation or confederation of nations, who is to solve the problem of establishing a legislative body to represent, on an equitable basis, the people who are to pay the taxes? (The reader is impressed with the practical character of the book.) Federation of the British Empire would be simple compared with the federation of Europe; the federation of Europe would be *simplissimo* compared with the federation of the world. Are we ready to pass the strings of our rich purse to the tax collector of Bokhara?

Colonel Vestal pays his respects to the international court as a means of settling political disputes. The analogy between such a court at the Hague and the United States Supreme Court, which decides suits between states of the United States, is challenged. In the one case, the issues are political; in the other, they are legal. Political issues, within the United States, come solely within executive and legislative jurisdiction. "It is the fixed unwillingness of men to settle political questions by judicial means" that always would defeat reliance upon universal arbitration. The most notorious of the few incidents of attempts of the United States Supreme Court to decide political questions was the *Dred Scott* case—in which the executive and legislative departments of the government disregarded the decision.

Aside from the force and eloquence of the author's scholarly protagonism for his thesis, this interesting volume commands especial attention for its magnificent review of military history—real history, for it not only makes an illuminating recital of the event but it applies the result of the issue of events to the march of life. We have the fascinating stories of Assyrian and Babylonian war lords committing their wild atrocities in the Euphrates valley during the second milennium B. C. We find Nebuchadnezzar mixed in pleasantly with the first example of the effective operation of the balance of power in 585 B. C. at the Battle of the Eclipse when he reconciles Cyaxares, king of Media, and Alyattes, king of Lydia, by proposing an international marriage intended to create binding ties amongst the three great powers of western Asia. There is an excellent précis of the integration of the Inca Empire whereby one fancies he sees the fifteenth century prototype of the German war machine of 1914. Persian and Macedonian epochs are given due notice. Roman strategic events are especially illustrative in the author's thesis. Even the greatest, if little known, sea fight, the Battle of Ecnomus, 256 B. C., is not overlooked.

Charlemagne was the first modern to upset the balance of power. Since his time, there have been periodical efforts: Spain, France, Russia, Sweden, in turn have overrun the continent while isolated England has aligned herself against the assailants of the balance.

But this manly book of honest courage, sparkling with the selected gems of some sixty centuries of fighting, has a great defect. Colonel Vestal adopts the historical method to discuss the world's peace. Then he entirely ignores the military history of a large part of the world—a part that is of particular interest to the peace of the twentieth century—Asia. Certainly the tremendous military events of the twelfth and thirteenth centuries, when Tartar armies raced across Asia north and south, east and west, in fiendish exploits, unchecked by scarcely a single defeat in the quarter of century of their greatest activity, must carry a lesson or two with respect to the maintenance of peace. If nothing more, it suggests that an obscure Mongolian tribesman with no following could rise, gain power, and conquer almost the entire known world. Why, then, should not some other leader appear for a Yellow host of fifty million men? And, as for the balance of power, what was the nature of the many dealings of the Great Mongol with the numerous nations that he controlled? In the same way, Colonel Vestal has disdained the Russo-Japanese War and the Chinese-Japanese War of 1895.

These are important omissions—fatal to the logic of the thesis. The American reader particularly would wish for the author's analysis of Oriental strategy in its bearing upon the American view of Pan-Pacific situations. Mr. Roosevelt advised that "a full knowledge of the history of the Mongol people is imperatively necessary to all who would understand the development of Asia and of Eastern Europe."

Colonel Vestal must amend his great book in its next edition so as to bring Asia within the scope of his logic.

The *Maintenance of Peace* is, perhaps, or may be recognized (when the substance of the solution or fluid state of international relations becomes precipitated) as the *Uncle Tom's Cabin* of peace-producing literature. It certainly stands out conspicuously among the greatest of military publications: Mahan, Clausewitz, Corbett, von der Goltz, etc. While it is compact with information that ought to be in the heads of good citizens, and certainly in the heads of men of the fighting professions, it is delightfully interesting in every page.

During the past thirty-four centuries there have been about 8,000 recorded wars, duly concluded by treaties of peace. In every century there have been ninety-three years of war and only seven years of quiet, as an average. If this old monster of the cartoonist's fancy is really dead, we must be interested in this book that is so close akin to the requiem for the "late lamented."

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of life, regular, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio,* an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become asociate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Asociate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

NOTICE

Naval Institute Prize, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the Proceedings during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the Proceedings during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles submitted be typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

C. C. GILL,

Commander, U. S. Navy, Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
Shore Duty for Enlisted Men.
The Limits of Specialization in Naval Training.
The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.
Armor or High Speed for Large Surface Vessels?
Airplanes and Submarines Versus Super-Dreadnoughts.
The Navy's Relation to the Nation in World Affairs.

At a meeting of the Board of Control, held 9 August, 1922, a resolution was offered and passed, that, in order to assist the Naval Academy authorities in obtaining a suitable textbook for a new course, the Naval Institute announce

A Prize Contest

for

AN OUTLINE PLAN

of a

Textbook for midshipmen

on

"HANDLING PERSONNEL"

This contest is open to all competitors, whether members of the Naval Institute or not.

The competition will be judged by the Board of Control and the awards made accordingly.

The first prize will be $200.

A second prize of $150, a third prize of $100, and a fourth prize of $75 will also be awarded, provided that the papers submitted are of character that, in the opinion of the Board, justify these additional prizes.

All papers submitted in this contest must be submitted over the signature of the author and reach the office of the Naval Institute on or before 1 February, 1923.

In judging these awards the criterion will be the usefulness of each paper toward the compilation of the proposed textbook. The *outline plan* should indicate clearly for each chapter its subject matter, scope and manner of treatment. Additional matter in the way of explanatory notes and illustrative examples based on naval experience are wanted and will carry weight in the contest according to their usefulness in the compilation of this proposed textbook to be used in an intensive course for first class midshipmen. A strictly naval book based on successful naval experience is desired.

None of the papers will be published in the Proceedings but it is understood that the Naval Institute is authorized without further compensation to use material from any or all papers submitted in the production of the proposed book.

C. C. Gill, *Lieutenant Commander,* U. S. N.,
Secretary and Treasurer, U. S. Naval Institute,
Annapolis, Maryland.

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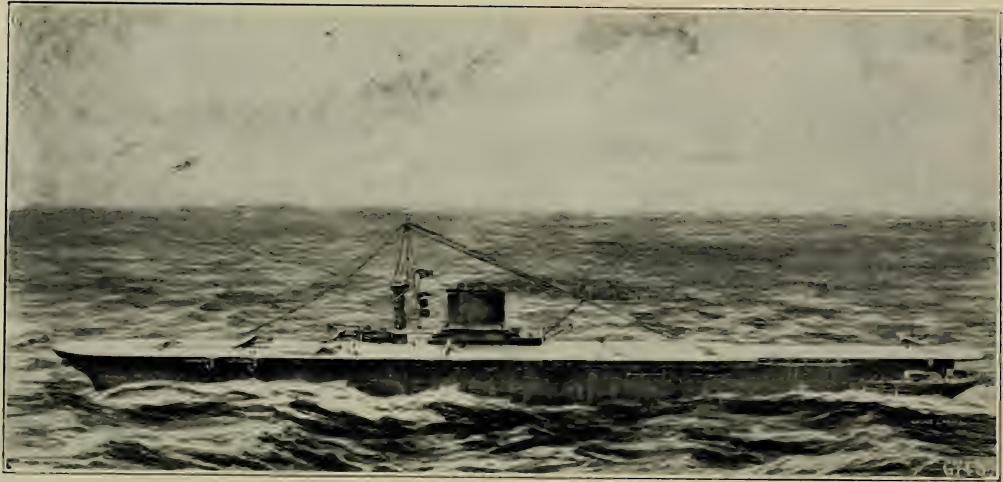

U. S. S. "Lexington" and "Saratoga"
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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SOME CONSIDERATIONS AFFECTING NAVAL POLITY

By Rear Admiral W. V. Pratt, U. S. Navy

"It is important to have our navy of adequate size, but it is even more important that ship for ship it should equal in efficiency any navy in the world."—Roosevelt.

It is not the writer's aim to discuss naval policy in its relation to national policies. It is, however, the purpose to show how certain considerations external to the navy and certain factors within the navy do affect naval polity.

Truth is invariable and everlasting. It is present always, but as an abstract concept it is sometimes difficult to encompass and often hard to envisage so that the living truth stands out distinct from its shadow. To apply it, so that the lessons dependent upon it are correctly interpreted and stand the test of time, is a perplexing task. Though truth itself is invariable, when we attempt to deduce naval truths from actual experience, or from a study of history, we enter upon that first twilight zone where paths are many and their directions divergent. But it is in the next step, through the endeavor to apply naval truths to the solution of some concrete problem that we are most apt to stray from the right road.

Nowhere is the danger graver than in the practical application to present needs, of the lessons learned from some late cataclysmic war. The psychic influences induced by such abnormal conditions

will of themselves weave a false mantle composed of fear, distrust and other elemental but harmful forces behind which truth is hidden. Where accurate records are available, time is the most potent factor in separating the true from the false.

Thoughtful naval men realize this condition, yet also they realize the necessity of gleaning the harvest of experience while still it stands ripe in the field. Fortunately there is given to us the orderly method of thought and its concrete expression embodied in the reasoned estimate of the situation and the concise decision. These latter are the tools of his craft—to be used by the expert workman in gleaning the truths of which the late war and history are so replete. Had our military leaders in France accepted at their face value, the then apparent lessons of the war, and been guided solely by the graver counsels of foreign war experienced veterans, they might have been so thoroughly imbued with the principle of immobility that a truer perspective of conditions would have been impossible. Who can say now what form the Argonne campaign would have taken even had it eventualized; yet it was the crowning stroke of the war.

As a word of warning, let it be said; at no time has there been a greater need than exists today, for farsighted naval statesmanship, and for true interpretations, not only of the lessons of the late war, but also of the trend of the times. Rightly or wrongly the mass of the American people look upon naval men as tinged with militarism. As a tradition this commonplace is accepted without much thought. If called upon to define the feeling, it would mean, probably, looking at the same subject from a different point of view. But even among more intelligent men, the criticism sometimes arises that naval men lack breadth of view, induced by their training, education and the life they lead. Whether this opinion be true or not is hardly to the point. That it exists is everything. Nothing tends more to accentuate this feeling than the constant presentation of broader naval problems, from a purely military point of view. What bearing does this have to naval polity: much, though its influence be subtle. It aids to make the average citizen look upon us as a class apart, not appreciating the fact that first we are citizens of the United States, and in the second instance, naval men. It, together with other influences, affects our relations with Congress. Foremost naval men must not be technicians alone (though in that they must excel), or else

they fail to live up to the examples and standards set by many of their predecessors. Public opinion has a distinct bearing on naval polity and is a factor of growing importance.

There are other considerations external to the navy to which thought might be given. It seems a far cry from the form of government we live under to matters affecting naval polity. Yet the distance is not so great as it appears. Strictly speaking, our government is neither democratic nor republican. More truly it is a constitutional government first and always, and a constitutional government administered by a free people functions best when its several parts co-operate thoroughly and loyally. Therefore any scheme of reorganization within departments, or interdepartmental, cannot with soundness, base its conclusions upon systems found efficient in less liberal and more autocratic countries. Autocratic, one-man control violates the American conception of the best form of administration. Respect for the basic law and a hearty co-operation in its support, are innate traits of American character, even during periods when acts seem to belie this statement. No organization, however specious the arguments in its support may be, that violate these requirements, will ultimately endure. Each new scheme should be closely inspected to see if it can stand searching analysis and is basically sound.

During the last war the feature causing most amazement to foreigners little acquainted with the inner workings of our apparently loose-jointed country, was the absolute co-ordination and co-operation of all its several parts, so that ultimately it became a well-oiled machine working for a purpose, and operating more efficiently than the German war machine ever worked; for, whereas the German war machine was perfect in details, it failed in its greater conceptions.

After each war, military and naval writers have spent reams of paper in explanation of the state of our unpreparedness on entering the struggle. Congress has held investigations in an endeavor to place blame where it belongs. Warnings are sounded; recriminations pass and repass; meanwhile, geography hides its head in its sleeve and laughs. Were we less fortunately situated with reference to other possible antagonists, the story would be different. We might be over-prepared, as is perhaps the case today with some other countries.

The character of a people has a determining influence upon

naval polity indirectly affecting the structure, composition, development and operation of the naval establishment. Keynotes struck in our international relationships, are altruism and idealism. Whether other nationals are so convinced, the American people themselves are thoroughly satisfied that this is true. There is ground for this belief. In the three hundred odd years of our existence, though wave after wave of foreign immigration has swept over us; though radical propagandists encounter less active opposition to the dissemination of their doctrines in this country than elsewhere, they have not been able to overcome the subtle but potent influence of the ideals which, first brought over with us, are maturing in a favoring soil and stamp the American people for what they are. Rather may it be said that the old American spirit prevails, if not in one generation, then in the following. Could any more convincing proofs of practical idealism and altruism be asked than were shown by our men and women during the late war?

Of all naval problems at that time, none had to be given more thought than the trend of public opinion. Naval operations by or against the Germans were, for much of the time, of relatively less importance than German propaganda. The united spirit of our people did much to kill schemes carefully prepared by cunning plotters, and lent itself to intelligent direction when necessary.

The temper of a people as manifested in public opinion may not be disregarded. What naval man viewing his problem from the military point of view only, could agree to the supreme sacrifice of naval strength which America made at the Washington Conference. Every historical fact told him he was correct in his conclusions that sea power, if it is to be enduring, must be backed by naval strength. Yet there are influences stronger than the conclusions drawn from historical and from mathematical deductions, and these influences may not be gainsaid. Who can tell that they may not portend a broader vision, more in keeping with the spirit of the times, than deduction drawn from the history of the seventeenth and eighteenth centuries? This may or may not be true. It must, however, be given due weight in the solution of great national problems.

International relationships have their bearing on naval polity. The true naval statesman, in peace, thinks less of what he will do in war, than of the part the navy should play to keep our country

out of war. It is a trite saying that sincere international friendships cannot exist. If, however, honor, respect for law and justice, sympathy for the under-dog, uprightness, fair dealing, are necessary components of stable friendships, then there is a future hope that the term international friendship may come into being. Much as the writer dislikes being in disagreement with some able writers on naval subjects, he cannot entirely follow their reasoning relative to Article XIX of the Treaty for a Limititation of Naval Armaments, nor accept as altogether sound their opinions of the status quo clause. They attempt to visualize conditions as they fancy they should be in the future, and from those premises draw certain conclusions. They do not accept conditions as they really are. The writer, from a natural naval viewpoint, appreciates the importance of naval bases strategically located. On the other hand, the naval point of view, or in other words the strictly technical viewpoint, never has, and never will be accepted in its entirety by the American people. In times of trouble, yes, perhaps; but in peace, no; and there is much practical sense in this attitude of mind. Therefore Guam and the Philippines never were, and never would be adequately fortified by us, in peace, as they might be by a more military government. These far flung, outlying positions, while not powerful enough to speak with armed authority, were nevertheless, a thorn in the side of Japan, continually aggravating the tension already existing due to competitive building and to misunderstandings as to national aims and aspirations. Statesmen have spoken, and their judgments are wiser than purely naval decisions, for they are based on a just and discerning estimate of all conditions.

Perhaps nothing is needed so much today in fostering good relations, as the friendly intermingling of nations. The man on the spot can frequently accomplish things which letters will not accomplish. There is something warm and personal in the friendly visit, contrasted to the colder and more formal diplomatic correspondence. It is a pertinent part of naval policy, wherever possible, to see that through naval contact any good understandings now enjoyed be maintained, and that any misunderstandings be adjusted. For those desirous of maintaining the peace, such would seem to be a correct line of conduct to follow.

National wealth, domestic conditions, foreign trade and many

other factors have their relation to, or effect upon, naval polity, and must be considered in any accurate solution of our problems. The sea trader is the pioneer, more than is the naval man, but as our sea trade increases in importance, so may the need for its support. From the time of the Phoenicians, the great Maritime traders, down to the present, water-borne commerce has represented or influenced sea power. Frequently the edicts of sound naval strategy have been violated, as was the case during the Napoleonic wars, when with no supporting fleet, our merchant marine carried the commerce of England and France in its bottoms, only however, because interests more potent were struggling against each other. It is often the external condition, not the technical military estimate, which governs, but these external controlling conditions are just as vital, just as true gauges to watch, as the purely naval factors. Perhaps a just appreciation of these things and of other vital essentials to the world life of nations may help us to make more reasonable estimates of international relationships, than the acceptance at face value as principles to guide us, of such trite, short, but somewhat commonplace expressions as militaristic country, traditional enemy, and other equally delusive statements, which are accurate only as they preserve their true balance in relation to other things.

On the other hand how many naval men, and especially how many outside the service, have given thought to the place the navy holds in the development of the industries and trade of our country. A study of this phase of naval activity would reveal much which is now unknown or not even dreamed of.

Again, economy does not and cannot mean to the government official exactly what it does to the business man. To live in business there must be profit, and where there is competition, economy must always be a very determining, if not the most important factor. The naval man, trained to look at his problems with an eye to accomplishing results first regardless of cost, places efficiency before economy. With us economy is weighed, sometimes in the same balance with efficiency, sometimes in the opposite. To both classes of men, naval expenditure represents overhead insurance, but the attitude toward it varies with the point of view. Both are equally patriotic citizens and their differences are capable of adjustment. The introduction of the budget system is practically certain to bring the business point of view more

to the fore in the handling of naval financial matters, with a consequent effect upon the entire naval establishment.

You may well ask, what is the purpose of the above statements—surely it is not to preach unpreparedness. No, it is not that. Listen to what one of the best friends the navy ever had, one of the foremost statesmen of his time, our great President Roosevelt, has to say, "The American people must either build and maintain an adequate navy or else make up their minds definitely to accept a secondary position in international affairs, not merely in political, but in commercial matters. It has been well said that there is no surer way of courting national disaster than to be opulent, aggressive and unarmed." This principle is sound and true.

But the time has arrived when it seems necessary to analyze certain external fundamental conditions in their relation to our navy, and to show how powerful these external influences may be. What is the corrective, if corrective be needed? It appears as simple as the answer given by the delegates at the Washington Conference. Arrive at better understandings with your world-over neighbors and see to it that the good relationships established are kept alive. Education of the public to know what its navy means to it, and tactful appreciation on our own part of the public point of view, will do much to establish, in our own country, correct and mutual understanding.

Were you to ask me, what is the most puissant external material factor, that has in the past and will in the future influence naval polity, I think the reply would be geography. Can any student deny that the heart of our naval policy is intimately interwoven with the correct interpretation of the strategy of the Panama Canal? Does anyone fail to see the close relationship of the submarine problem to geography? Whether it be in the air, on the waters, or under them, we eventually return to geography, to our singularly fortunate position so favorably fixed geographically in relation to other nations. It is needless to go into details. The thoughtful man may read and draw his own correct conclusions.

Hand in hand with an appreciation of our own world position, our affluence, capabilities, and limitations, must go knowledge and recognition of the position which other countries occupy in relation to ourselves and to one another. Their aims, aspirations,

and the vital necessities essential to a sane and normal national life must be comprehended, if we would maintain that position of leadership, not sought but which a growing and war sick world has thrust upon us. By treading the straight path of national uprightness and fair dealing, never swerving aside to secure a minor victory when the greater goal lies ahead, impelled by sympathy towards all and actuated by malice and suspicion towards none, our country will move on to the accomplishment of its ordained purpose. As servants of our country, naval men must take these lessons to heart, if they would serve best. Let it be said here, that whenever naval men have been entrusted with the conduct of international matters, almost invariably they have, due possibly to training and to a fair knowledge of world affairs, executed their missions satisfactorily, as recorded testimonials will bear witness.

Powerful as is the influence of external factors upon naval polity, and interesting as may be their study, yet the seagoing officer is much more concerned in the internal relations of the various parts of the naval establishment to each other, in their proper organization and efficient administration. Particularly is his attention centered in the sound administration and operation of the fleet, for in it he sees the hammer with which, in time of war, he may drive through all obstacles to secure for his country the purpose for which the fleet exists. No officer, the major part of whose life is spent at sea or in dealing with matters pertaining to the sea, can help being vitally concerned in the efficiency of the fleet. To command the fleet is the summit of his naval career.

In general, naval policy may be defined as the system of principles and the general terms of their application, governing the development, organization, maintenance and operation of the navy. It is based on and designed to support national policies and American interests. It comprehends the questions of number, type, and distribution of naval vessels and stations, the character and number of the personnel, and the character of peace and war operations. This precept guides our administrative acts.

During peace the normal tendency for the component parts of a naval establishment is to adjust themselves along sane and harmonious lines, keeping step with the progress of the times. Like seeks like, and progress and development in type move hand in hand, provided that initiative be not stifled, imagination is given

free rein, and slothfulness and sluggishness do not permeate the naval body. Given sufficient foresight in our leaders and ample time for preparation and training, an organization along these lines should be able to adjust itself to the more special and intensive tasks demanded of it in war. Such has been the method of our naval development in the past.

After every great war there is the very natural tendency to assume that other wars will follow the course of the last. While in major premises this is reasonably true (such as predicating economic war), methods and details to carry it out will change. An impulse, therefore, is given to our naval establishment to make it conform to and adopt the practices of the last war. This impulse followed to extremes, would impose upon us the methods of the last war rather to the neglect of a study of principles, some of which may have been handed down to us from history as effective through long periods in the past. This inclination to adopt methods in lieu of analyzing principles is a danger which should be carefully guarded against, for it may lead to false conclusions and it is apt to crystallize our conceptions as to what warfare in the future will be. The methods that served well three or four years ago, if adopted even ten or fifteen years hence may be antiquated and out of date, however true the fundamental principles upon which they are based. It is to guard against the fallacious idea of adopting past practices as a substitute for the study of principles, that this note of warning is sounded.

There are certain basic laws upon which the naval establishment should be organized, administered and operated. No violation of these laws will stand the test of time, regardless of how specious may be the arguments presented in favor of any particular method of application. During the progress of war there is usually an inclination to centralize, and to vest supreme control in the persons of few individuals. If allowed to run its natural gait, this tendency will in war adjust itself to the needs of the time. But if, in time of peace, we assume that the conditions imposed by war are the natural and normal conditions upon which to base our permanent organization, we err greatly in principle. The very foundations upon which our governmental structure rests, demand of our central organizations the ability to co-operate to the utmost, rather than to direct to the maximum. Our personnel also lends itself best to a form of control by induc-

tion, in contra-distinction to one by direction. The system of departmental organization, much as it has been attacked, especially since the late war, is sound in principle and conforms to the same basic laws that tie our federation of states into such an harmonious whole. The co-operation of the various integral parts of our central naval establishment is soundly arranged for through the agency of a co-operating and administering military head. The advisory and plan-making bodies co-ordinate their activities directly through this head with the civilian head. No military head can assume the duties of the civilian head of our naval establishment without violating some of the principles upon which our government is based, for it is not within his power to co-operate as fully with the legislative bodies as can the civilian head appointed for this purpose. The amount of influence and direction which the military head exercises, depends entirely upon the conditions which confront our country at the time. If it be peace, the function of a military head is largely advisory, and in a broad sense inspectional; in a more minor sense it is directional. In time of war the directional function increases in importance and that of inspection is relegated to a minor place. The advisory function maintains its same relative position, but the character and importance of subjects handled change.

In certain countries there has arisen the apparent need for a department of national defense which combines under one head all military, naval and allied civil activities. Impelled by some specific and local urge, nations which have in the past lent themselves to alliances of alien interests, are more free to adopt such a system than is a country like our own with a looser form of government, thoroughly disliking any form of alliance of different interests, or even a too intimate association of similar interests if it be built up to constitute a super body. In the organization spoken of above, it is easy to trace certain psychological effects produced by the late war. The word defense is itself an expression of the fear which actuated these countries when they formed this body organic to protect themselves. It has been adopted by some countries where the time element is of greater importance than it is to us who are allowed more latitude in this respect. It is the attempt to combine under one superhead various separate activities, each having a life, a purpose and a function of operation individual and distinct from the activities of the other organi-

zations with which it would ally itself. The result is to create a superhead whose functions in war would infringe upon those of the constitutionally appointed commander-in-chief, in whose person is now vested the general direction of all war activities.

Another effort which will bear close analysis, is the attempt to organize all air activities, naval, military and civil, under one independent head with the objective of obtaining complete air control, and through that control effecting complete war control, and ultimately victory. The one nation which has accepted this organization is England, and apparently she purposes to accomplish by organization some of the things which France, just across the channel, imagines she can do through the agency of adequate mobilization. It is not the writer's intention to contrast the conceptions of other nations in these matters, except as they affect America's interests. It might be pertinent, however, to point out that French military strategy and tactics, in the main, have been unusually sound; while England's naval strategy and tactics have been equally so. In view of the almost universal soundness of England's sea policy, the separation of her naval air force from her navy is not entirely clear. It might, perhaps, aid us to quote certain succinct paragraphs taken from the Geddes report, on the question of a separate air force.

> The air force was essentially a war creation, and owed its separate existence mainly to the necessity for preventing competition between the navy and the army for men and material in aerial warfare. It was also felt at that time that a definite function of independent air attack was called for, but would not be realized unless the air arm was freed from naval and military control. No other nation, however, has as yet followed the example of this country in establishing such a separate force. . . . We appreciate that it is only on financial grounds that our terms or reference would entitle us to express opinions on the question of a separate air force.

England's problem is evidently not our problem. No independent air effort will ever be initiated by us, which first must not be supported by sea force, and second, by land force. For a period of time man, like the bird, may fly in the air, and, like the fish, live under the seas; but eventually, he comes to stable rest on the surface of the earth; and fighting force must ultimately express itself in factors composed of military power on land and naval power on the sea. To learn their sea problems,

there must be a naval air force, animated by the same purpose that directs the grand sea campaign. There is undoubted need for the development of civil air activities, but the relationship between the civil air force and the naval air force is about the same as that existing between the navy and the merchant marine. Of the three forms of control, air, surface, and underseas, there is but one form, surface, which contains within itself that complete cycle of basic war functions, which, if exercised independent of the other two forms of control (in the sense of their being non-existent), contains all essential strategic and tactical qualities which will eventually encompass all war problems necessary to bring the grand campaign and eventually the war to a successful conclusion. Due to certain natural qualities inherent to the mediums in which they work, and influenced also by the physical locations of the objectives for which they must strive, both the underseas forces and the air forces lack certain basic war assets without which a complete and independent cycle of war functions cannot be maintained. The submarine lacks the necessary flexibility, without which it cannot independently effect complete defeat of its own kind, nor impose its full will on other fighting types. The aircraft lacks complete tactical endurance, which defect renders it incapable of performing those patient and continuous war operations as successfully as other war types whose expenditure of war energy is so much less. On account of the extreme mobility possessed by this type, it cannot hope to contain the enemy to the same extent that other war types may, nor is it able to retain war gains to the utmost limit, as may infantry forces. Therefore, independently and of themselves, the air and underseas forces cannot with full efficiency wage complete war, but must ultimately be supported by and be supplementary to the surface forces whose objectives and war functions will in the end dominate.

Shore establishments in the shape of navy yards, training stations, naval bases and educational institutions, came into being through the process of evolution and to serve certain conditions existing at the time when they were born. Their main military purpose is to serve the fleet. When international conditions change, adjustments of our shore establishments will have to be made. The position of the United States fronting two great oceans, one replete with a historical war past, the other full of

future possibilities, is unique and peculiar. A happy balance must be struck between those establishments serving the fleet in one ocean and those necessary to the life of the fleet in the other. But no matter what the present strategic demands may be, it must be borne in mind that a fleet cannot exist if those forces on shore which give it life, sustenance and rest, are destroyed. And it must further be remembered that while naval strategy has a tendency to look ahead to the future, it must not entirely forget the past. Neither must it neglect to note that shore facilities built up with much care and thought, through a long space of time, and activities carried on by a competent personnel, cannot entirely be disrupted without gravely affecting in some manner the efficiency of the fleet. No naval man should look too far in the future and make decisions based upon premises which may not exist fifty years from now. Therefore, while reductions are always proper, total abolition of existing facilities, in the long run, may be unwise. Adjustment is the far safer and saner course to adopt; a wise adjustment tempered by economy. Nor should we, in preparing for the future, be governed by a too great local and present urge. Rather should the whole situation receive calm and grave consideration.

Coming then to the fleet, and considering the purpose for which it exists, and the methods whereby it lives and perfects itself as a war organization, we arrive at that part of our naval establishment which always must give the maximum amount of concern. By the fleet, in this particular instance, is meant all of those forces afloat necessary for the successful conduct of a sea campaign. In its broadest aspect we may say the fleet is composed of two parts. The first and most important part comprises the fighting forces, those which through operations against the enemy, accomplish certain definitely desired results. Broadly speaking, these results may be the destruction of the fighting sea forces of the enemy, containing the fighting sea forces of the enemy, and operations directed against the enemy's economic life. To effect any of the three purposes indicated above, much detailed work must be performed. Parts or all of the fighting forces will be occupied in the performance of tasks already indicated through past experience, or in undertaking new tasks. This general line of conduct will govern the activities of the fighting forces during the entire campaign. Time is an exceedingly important element

for the fighting forces of the fleet to reckon with. Ability to pass quickly from one set task to another without too great disruption of the major purposes of the campaign must always be had. Imagination which looks ahead, visualizing the intentions of the enemy even before they are indicated, must always stand at the right hand of the commander-in-chief as his guide. The purpose which he has in his mind, carried as far into the future as it is wise to predicate, must animate the actions of all subordinates, though indeed, if they fully comprehend his purpose much individual initiative may be theirs. In times where quick action is needed, it is not always possible to issue that series of detailed instructions which will enable one to cope with an immediate task, and then to press on to tasks following close on the heels of the first. Not only should the commander-in-chief be able to make immediate and accurate decisions, but above all, his purpose must be sound and thoroughly understood by every subordinate in order that the fewest orders, simply expressed, may flow between them. Likewise his purpose and immediate decisions should be altered as seldom as sound strategic conception and good fleet management will permit. This is accomplished only through a thorough indoctrination of all the forces under his command. Indoctrination itself will not be complete unless it is based on a sound groundwork of study and preparation, and much actual work in the way of theoretical and practical sea maneuver is given.

Visualizing naval matters from the broadest viewpoint, the second great part of the fleet will be composed of those auxiliary forces or of our advanced bases whose purpose it is to sustain or support the fleet. The activities of these auxiliaries, while perhaps not so spectacular as those of the fighting force, are more continuous and at certain stages of a campaign may become even of relatively greater importance; as, for example, if the character of the campaign changes from one purely naval to one also involving military activities. Then, operations ceasing to become purely naval in character and combining with military activities, the importance of the auxiliary fleet may be supreme. So great may become the import of these allied operations, that great pressure may be brought to bear on the fighting sea force, even to an extent tending to divert it from its main and logical mission. One consideration which must always be given the activities of the auxiliary fleet is the fact that its operations, when begun,

should be continuous. In general, the operations of the fighting fleet, to be effective, must be timely and conducted with a maximum degree of concentration. The activities of the auxiliary fleet are apt to be more continuous than timely, and are more often scattered than they are concentrated.

Out of the efforts which the attacking fleet and the auxiliary fleet must make, there comes into being another set of operations which should be taken into the reckoning. As a fleet advances and occupies positions given up by the enemy, these posts must be held and maintained for our own purposes. The supplies necessary for the upkeep of the fleet or its personnel, the ships carrying troops (if a long campaign be contemplated) and the supplies necessary for their sustenance must flow continuously onward. These operations call into existence a third class of war activities which falls into the zone lying somewhere between the operations of the fighting fleet and the operations of the auxiliary forces. Speaking in broad terms, the operations of this third force (which for purposes of organization we may call a control force) are in character more defensive than offensive. In the course of a long war its operations will tend more to co-operate activities with the auxiliary forces than with the fighting fleet. Here again, however, this statement must be tempered by the thoughtful use of geography. As we advance further toward the enemy's country the purposes of the control force blend more with the purposes of the fighting force. In one respect, however, operations of the control force vary from those of both the fighting fleet and the auxiliary forces. While the operations of the fighting fleet may be specially characterized as timely and those of the auxiliary forces as continuous, the operations of the control force, while undoubtedly they will be continuous throughout a war, on occasions may need be very timely. However, in general, as we review the major character of the operations which a sea campaign will engender, we see at a broad glance that all these sea activities may be classed as specific war tasks, whether they be conducted by the fighting fleet, the control force, or the auxiliary forces. Some of them are so common to all wars that we may predict their continuance in the future. Some of them are so evanescent in character that their purpose may have ceased with the late war. Others yet may not be born. The matter which concerns us is how may we lay our plans so

that, if the need arises, we may use all of our sea forces in the way which will produce the most efficient results. Looking then at the complete cycle, it seems fair to the writer to assume that the *training* of the fleet to accomplish efficiently those tasks which it *might* be called upon to undertake in war, and the performance of those duties which it *must* undertake in peace, are the prime missions on which the organization, distribution, and operation of the fleet must be based.

As has been stated before, there appears to be a natural tendency to adopt methods, as easier and perhaps safer than analyzing principles. If we stick too closely to past methods we lose the art of reconstruction. If, for all classes of fleet forces we adopt as basic, organization on the task group principle, and predicate for the future those tasks found essential in the past, we assume that, regardless of changed conditions, regardless of the number of years we may be at peace, regardless of external conditions which may be imposed upon us, the next war will run the course of the last. This assumption renders us liable to commit grave errors. As said before, those operations and methods which will be continuous, which history has shown will be repeated century after century, it may be safe to predicate a long time in advance. For this reason the auxiliary forces may be organized on the task group principle; though here again task is by type. But in the sphere where operations must be timely, where the engines and inventions of war change rapidly, where the imagination should work freely, where ideas and methods take on a new and increasing importance, it is an unsafe practice to tie up organization too closely with the past in the endeavor to make it take the place of adequate mobilization and timely distribution. But this is exactly what any organization of a fighting fleet on the task assignment principle does. You have but to turn to one of the commonest examples in ordinary life to realize what is meant. In a normal life, girls flock with girls, children with children, and young men with young men. During the formative, educational and training portions of their life they, for the most part, grow and develop by types. Later, for the accomplishment of certain set tasks they may group themselves into social organizations. It is believed that it is a more normal, flexible, and progressive way to organize by types and to train these types to perform all tasks which may fall to their lot, than it is permanently to organize

during the training period on the principle of intermingling types to perform certain war tasks which may or may not eventualize. It is wrong to charge organization with an overload which should be carried by other agencies. The battleship has a mission of its own to perform, built into it in the very nature of things, stern and inexorable as fate. That mission it must perform, shoulder to shoulder with other battleships, though in the course of events it may perform other tasks. Its main mission, however, is fixed for it, and it is unsafe to disregard it and to make it secondary to other tasks, the methods of whose accomplishment change with time and type. The doctrine of the destroyer is not the doctrine of the battleship. The doctrine of aircraft is not the doctrine of the destroyer or of the battleship. The doctrine of the cruiser may in details differ from all. Nevertheless, all types may be combined to perform set tasks as occasion demands, and during joint maneuvers the points where the various doctrines intermingle will become established. Basing organization on the task group principle hampers the free inception and flow of doctrine, and it has a further tendency to crystallize the organization into the task form or the task group laid down for it. There is one very vital war fundamental which the segregation into task groups tends to violate, namely, the principle of concentration of force. Where types develop their own doctrine, each emulating the other to see as far into the future as possible in order to make themselves proficient in any or all tasks which may be assigned them, a quite different principle is involved from the one where a set task is assigned to a certain group and that group is organized to perform that task as its permanent mission. Though under the task group organization there still exists need for the various groups to come together, co-operating thoroughly in strategic and tactical problems, a tendency is bound to be created for each task group to believe that it can accomplish its own appointed work by itself. Each new problem also will require a new task assignment if it covers original ground. In indoctrination by type, however, there is always the realizing sense that the major problems of strategy and tactics can never be accomplished unless all parts of the fleet are constantly in touch with each other and sharing each other's views and life through physical contact.

Perhaps the most subtle but demoralizing influence which the task group organization exercises is the undermining influence

which it exerts upon leadership, as expressed through and in the person of the commander-in-chief, by the handicap which it imposes upon the free development of doctrine. Through doctrine is imposed upon all forces the purpose and personality of the commander-in-chief. Through doctrine is effected the maximum concentration of purpose through the maximum decentralization of administration. Any weakening of this instrument is a weakening of the influence of the commander-in-chief, and consequently, a disorganization of the forces under his command.

It is not to be expected that many of the conclusions reached in this article will be agreed to. The conduct of naval affairs always will be influenced by temporary expediency. Yet expediency must be the exception, not the rule. Through the agency of the Washington Conference limits have been placed on naval armament. Though possessing the national wealth to do so, we may not spend as we will on naval construction. Congress also has set bounds to personnel and to expenditures. It therefore behooves naval men to take account of stock and to bend every energy to make our navy second to none.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE U. S. NAVAL AIR FORCE IN ACTION 1917-18

BY LIEUTENANT COMMANDER W. ATLEE EDWARDS, U. S. NAVY

NOTE:—The following communication has been received from the President of the Naval War College:—

This brief but comprehensive résumé of the activities of the U. S. Naval Air Force in action during the World War was prepared by Lieutenant Commander Edwards at my request, and has been incorporated in the Reading Course of the Naval War College. It is accurate as to details and covers the salient features of our activities in this field of endeavor in a very thorough manner.

As Aide for Aviation on my Staff during the World War, and Chief Liaison Officer to the British Air Ministry, Lieutenant Commander Edwards occupied a position which enabled him to study the Strategy and Tactics of the Air in its relation to naval operations to an extent which, in my opinion, qualifies him to write authoritatively on this subject.

Wm. S. Sims,
Rear Admiral, U. S. Navy.
EDITOR.

It is scarcely an exaggeration to say that less is known of the activities of the U. S. Naval Air Force in action than any phase of America's effort during the Great War. This is, doubtless, due to two reasons: first, the work was not spectacular and, secondly, the Armistice intervened before our air program had fully matured. Almost without exception accounts of air operations have been written for popular consumption and have, therefore, concerned themselves principally with the romance of the air; with the records and thrilling adventures of American Aces, ignoring for the most part the vast amount of preliminary work, the careful planning and the arduous training which made these aerial fighters and their heroic exploits possible.

The mission of this paper, as I conceive it, is to sketch briefly and in a more or less technical way the organization, administration, and operation of the U. S. Naval Air Force Foreign Ser-

vice during the Great War, and, by way of establishing my claim to write with some degree of authority on this subject, I beg leave to state that it was my very great good fortune to have served as Aide for Aviation on the staff of the commander of the U. S. Naval Forces operating in European waters from October, 1917, to April, 1919, with additional duties as liaison officer to the British Air Ministry.

Anticipating the inevitable question, "What did naval aviation do during the war?" I would submit the following by way of reply:

Officially the U. S. Naval Air Force Foreign Service executed thirty-nine attacks against enemy submarines, of which ten were considered to have been at least partially successful; it dropped 100 tons of high explosive on enemy objectives, and it had to its credit a total of 22,000 flights in the course of which it patrolled more than 800,000 nautical miles of submarine-infested areas. In point of fact it did immeasurably more than this, for these figures are very far from being a just or fair method of appraising the value of aircraft in naval warfare. I say this because almost always the damage inflicted by aircraft, when operating against surface craft, was of a contributory and indirect nature—"the seaplane summoned destroyers to the scene of action and the submarine was destroyed" describes what is meant by "indirect" in this sense. The destroyers almost always got the credit, whereas the aircraft, the indirect destructive agency, was really responsible for bringing about the action in which the submarine was destroyed. Again negative information is often as good as positive information—it is frequently just as important to know that the enemy is not there as it is to know that he is there—and so, too, a harmless submerged submarine was often just as good as a dead one. This was especially true in the case of convoy operations, with reference to which Admiral Jellicoe, writing to Admiral Sims under date of August 22, 1917, said in part:

> To date there has been no case of a vessel being attacked by an enemy submarine when aircraft has been present, while in several cases the submarines have been sighted and compelled to abandon their attacks.

It is not intended to convey the impression that aircraft were content with keeping the submarines under the water, but this was their secondary mission in order to divert them from their

work of destruction through fear of the consequences. Personally I hold strongly to the belief that during the war enemy submarines were much more afraid of aircraft than they were of destroyers, because of the greater range of vision of the former over the latter. Having spotted the submarine, it was then a simple procedure to summon such surface craft as might be in that area by means of radio or visual signals. Due to the shallow and discolored water of the North Sea and to a less extent the waters adjacent to the western coasts of England, Ireland, France, and Portugal, it was extremely difficult for aircraft to pick up submerged submarines, although there were several cases on record in which this was done to the ultimate destruction of the submarine. In certain localities, however, notably in the Caribbean Sea, the nature of the water and of the bottom are such that submerged submarines can be detected at great depths and from considerable distances.

In order then to form any just appraisal of the value of aircraft in naval warfare, one must take into account the "negative" results attained, of which a great many must, of necessity, have developed from the 800,000 miles of patrol duty which stand to the credit of our Naval Air Force during the war.

Having reviewed briefly the accomplishments of our Naval Air Force, it now seems logical to proceed with a description of how this force was assembled, organized and operated.

In common with all the nations involved in the Great War, save perhaps Germany, America was unprepared in aviation. There was some excuse for this in the case of Great Britain and of France, for aeronautics was hardly beyond its beginnings in 1914, but this offers no explanation of the lack of attention paid in America to air preparedness. Nor is it an excuse to say that we could not foresee our participation in the general world upheaval, for events proved that anything was possible, and a reasonable amount of foresight in preparation would have been of incalculable value during 1917. Indeed, it is more than strange that Americans should have noted the enormous expansion of aerial activities in Europe, and read the accounts of results obtained by the air squadrons both on land and sea, and yet remained so inert in demanding at least a nucleus of an air force.

Yet, such was the situation. An inventory of our effects in the spring of 1917, showed that we had practically nothing in the way of material and very little in personnel. In fact, prior

to 1916, no appropriations, save small ones for experimental purposes, had been made for aviation, the first appropriation of any consequence, $1,000,000, being made in 1916. Yet it must be admitted that we had something that was worth infinitely more than all we lacked—"the will to victory." And behind that lay American ingenuity and the vast resources of our great country. We knew that we could not lose in the long run, but the important question was, "Would our intervention be sufficiently prompt to insure success?"

That our outlook in aviation at the moment of our entry into the war was gloomy, to say the least, is obvious; we were not only unprepared but we had very little idea of how to prepare for aerial warfare, as is evidenced by the following cablegram from the Secretary of the Navy to Admiral Sims under date of April 20, 1917:

> Immediate and full information is desired by the Navy Department as to the present development by the British of their naval aeronautics. What style of aircraft is most used and what is most successful over the water? What is the method of launching at sea when carrier vessel is under way? For coastal patrol and submarine searching what are the types of aircraft used?

This request was complied with in minute detail, and sufficient additional information was furnished the Navy Department to enable it to put forward plans looking to the construction of seaplanes and their accessories. The submarine campaign had at this time reached such an acute stage that it was deemed advisable to request priority of shipments of naval aircraft over those intended for army use and this was granted.

Meanwhile, an "Estimate of the Situation" existing in Europe was prepared, and read as follows:

ENEMY FORCES—THEIR STRENGTH, DISPOSITION AND PROBABLE INTENTIONS
(Fall of 1917)

The number and types of enemy submarines are well known and their probable intentions can be predicted from their past performances. Generally speaking they operate in the lee of the land during bad weather insofar as is possible.

The English Channel, the Irish Sea, and the south coast of Ireland are favorite localities during the winter months. During the summer months enemy submarines as a rule extend their activities to seaward and to the southward into the Bay of Biscay.

The east coast of England, and Scotland and the Mediterranean Sea are operating areas throughout the entire year.

The enemy maintains command of the air over the North Sea from Dunkirk to the northeastward.

Enemy anti-aircraft defenses are efficient and compel increasing altitude when flying in their vicinity.

From this information we deduced our mission to be:

(a) To make our primary air effort a continuous bombing offensive against enemy naval objectives.

(b) To make our secondary air effort a patrol of those areas frequented by enemy submarines in readiness for a tactical offensive.

(c) Troop and merchant convoy escort duty.

This general policy was endorsed by Admiral Sims and agreed to in principle by the Navy Department, and while the personnel and the material essential to our war operations were being assembled in the United States we, on the other side, proceeded to dig ourselves in, so to speak, by building the several air stations as shown on the diagram on the following page.

In spite of our relative unpreparedness in aviation, it is a noteworthy fact that the first American force to land in Europe was the First Aeronautical Detachment, consisting of six officers and sixty-three enlisted men. This detachment reached France on June 5, 1917, and immediately went into training for active service. From this modest beginning our air force grew steadily until at the date of the Armistice, November 11, 1918, it included in its organization 1,147 officers and 18,308 enlisted men operating more than 400 aeroplanes and seaplanes, 50 kite balloons, and 3 dirigibles. It had to its credit a total of 22,000 flights and had patrolled over 800,000 nautical miles; all of this with only nineteen casualties. Truly, a record of which the American people may be justly proud!

The building up of the personnel and equipment, however, was but a part of the task; the men and the machines must be housed, landing fields and repair shops be provided—in fact, everything necessary to render offensive operations possible. This meant the construction of bases. Some idea of what this "digging in" process was may be obtained by the realization that it involved the use of 21,384,000 feet of lumber, or sufficient to build a boardwalk, one foot wide, from New York City to the island of Malta—

a distance of 4,127 miles; that the total cubical contents of all structures erected, if assembled and made into one, would represent a box in which ten Woolworth Buildings could be housed; that 500 miles of telephone wires were run and hangars were assembled sufficient to cover forty city blocks if made into one.

The total appraised value of all this construction work was approximately $11,250,000,—the total sum expended in aviation was $52,256,398—a large sum of money, but an investment

which would, I think, have returned us handsome dividends had the war continued. Indeed, by the summer of 1918, we began to see and feel the results of our efforts, for eleven stations had been built, of which six were in operating commission with planes which we had borrowed from our Allies, and by the end of the year our total war strength stood as follows:

TOTAL STRENGTH OF THE U. S. NAVAL AVIATION FORCE, FOREIGN SERVICE AS OF NOVEMBER 11. 1918

	Station	War Operations Commenced	Aircraft Nov. 11, 1918	Number of Flights	Sea Miles Patrolled	No. of Officers	No. of Men
France	Brest	Aug. 1, 1918	30 Seaplanes	211	7,355	31	814
	Fromentine	Aug. 9, 1918	14 Seaplanes	335	38,009	31	372
	Arcachon	Oct. 1, 1918	7 Seaplanes	106	8,727	26	318
	L'Aber Vrach	July 23, 1918	19 Seaplanes	355	29,302	41	458
	Ile Tudy	Mar. 7, 1918	21 Seaplanes	1,238	104,877	22	363
	Le Croisic	Nov. 18, 1917	16 Seaplanes	1,045	113,324	24	337
	St. Trojan	July 3, 1918	13 Seaplanes	246	19,533	26	343
	Frequier	Sept. 30, 1918	8 Seaplanes	30	1,380	16	266
	Dunkerque	Mar. 18, 1918	12 Seaplanes	491	45,630	7	205
	Paimboeuf	Mar. 5, 1918	3 Dirigibles	257	48,630	30	477
	Guipavas	No operations	1 Dirigible	....	....	15	396
	Gujan	No operations	None	....	....	10	240
	Brest (k.b)	Test Flights	22 Kite Balloons	....	....	18	59
	La Trinite	" "	4 Kite Balloons	....	....	5	150
	La Pallice	" "	4 Kite Balloons	....	....	9	216
	Pauillac	Test Flights Repair Base, July 2, 1918	81 Seaplanes	Test 372 Training	Test 15,085 Training	133	4,071
	Moutchic (School)	Training Flights Nov. 11, 1917	24 Seaplanes	10,807	242,320	57	493
Ireland	Queenstown	Sept. 30, 1918	28 Seaplanes	64	11,568	72	1,426
	Lough Foyle	Sept. 3, 1918	7 Seaplanes	41	6,000	20	432
	Wexford	Sept. 18, 1918	5 Seaplanes	98	19,135	22	405
	Whiddy Island	Sept. 25, 1918	3 Seaplanes	25	3,870	18	400
	Castletownbere	May 21, 1918	16 Kite Balloons Test Flights			12	91
Italy	Porto Corsini	July 25, 1918	17 Seaplanes	745	?	27	360
	Lake Bolsena	Feb. 20, 1918	8 Seaplanes	5,540	?	11	69
England	Killingholme	Feb. 19, 1918	46 Seaplanes	404	92,797	91	1,324
	Eastleigh	Sept. 24, 1918	41 Seaplanes	Test Flights		70	1,928
Northern Bombing Group		July 20, 1918	35 Aeroplanes	80 tons of bombs dropped		294	2,154
	Total War Flights	5,691			549,078		
	Training	16,347			242,320		
	Total	22,038			791,398	1,147	18,308

11 men, 8 officers reported as casualties; 2 officers were taken prisoners of war.

The foregoing table shows that twenty-seven air stations were provided for, of which eighteen were in France, five in Ireland, two in Italy, and two in England. Two of these, Pauillac in France, and Eastleigh in England, were assembly and repair bases, and one, Moutchic in France, was a school for training aviators. All of the others were operating bases.

The mission of the operating base or station was to do all possible damage to the enemy. The conditions determining the use of aeroplanes in land operations are, of course, familiar, and are vastly simpler than the problems confronting the seaplanes, which must operate over the sea, patrolling submarine-infested areas, escorting troop and merchant convoys, searching out mine fields, and making general or specific reconnaissance flights. The following statement gives an idea of the activities of one of our seaplane bases situated on the east coast of England, covering a period of about four months (July 20 to November 11, 1918):

Sea miles patrolled	57,647
Hours of flying	968
Number of flights	233
Average duration of flights	4 hours, 10 minutes
Number of ships escorted	6,243
Number of forced landings	35

The efficiency of the personnel and material of this station is emphasized by the small percentage of forced landings, which, by the way, was typical of all. This indicates that when our seaplanes finally did arrive they were superior to any in existence. Five and even six hour flights in them were the rule rather than the exception. The record was a flight of 9 1-2 hours' duration made by personnel attached to our air station at Queenstown, Ireland. Another notable flight was one of nine hours' duration, the machine carrying a full military load, which was made by personnel attached to our seaplane station at Killingholme, England.

While, as is indicated by the table, the majority of our stations took part in military operations, the most active were those in England and Ireland, Flanders and the Adriatic. Of them all the one at Killingholme, on the east coast of England, near the mouth of the Humber, was not only the most important but in one detail the most interesting. The station was created for the purpose of trying out a scheme for raiding the enemy bases in the Heligoland Bight which had been originated by the British Admiralty. This was, in short, a scheme to transport seaplanes on lighters, or floats, towed by destroyers to within easy striking distance of Heligoland, Cuxhaven, Bremerhaven, Emden, and Wilhelmshaven. When the float had reached its station, it was given an inclined position by flooding a rear compartment,

the seaplane rising from the deck. Although preliminary trials demonstrated the entire practicability of the plan, it was subsequently abandoned because of the fact that the British, in their enthusiasm, let the cat out of the bag by making a test flight in the vicinity of the Heligoland Bight, during which operation a Zeppelin took photographs thus destroying the element of surprise upon which the entire undertaking was based. Furthermore, after the fusion of the Royal Naval Air Service and the Royal Flying Corps into the Royal Air Force the co-operative spirit between the army and the navy sank to a very low ebb, and when these lighters had been built the project had to be abandoned because the Admirality decided that they could not spare the destroyers that were necessary for the execution of the project.

This experiment is further interesting for the light it throws upon the wartime psychology of the British; upon their will to victory. We all know of their strange and new devices for winning the war, which were successful; of their "hush ships," their camouflaged fleets and their "Q" ships. These were successful, but few of us have heard of the many schemes proposed and tried out, often at the cost of hundreds of thousands of pounds, all to no purpose. Nothing, apparently, was too fantastic to be given a trial, and if it failed it was shrugged aside as part of the game.

The original Killingholme project was one of these wild experiments that failed, yet the success or failure of the original plan had no effect upon our subsequent operations there. The location of this base, situated as it was on the east coast of England, directly opposite the Heligoland Bight, was most important from a strategical point of view. It was accordingly developed as a base for ordinary aerial operations, becoming eventually one of the most powerful in existence, with 46 seaplanes and a personnel of 1,928 men; 404 flights were made by these machines covering a distance of nearly a hundred thousand miles. Shortly before the Armistice was signed it was decided to reinforce this station with seaplanes that had been operating from our stations on the French coast. This was accordingly done, and had the German High Seas Fleet taken the seas it would most certainly have felt the pressure of American planes in the North Sea and we would have been in a position to judge of the value of aircraft in a naval action. The ease with which these planes were flown from France and housed at small improvised stations in the

immediate vicinity of Killingholme speaks well for the flexibility of this arm of the service. Although it is somewhat of a digression from the subject in hand, it may be well here to invite attention to the fact that the fundamental principles of aircraft are the same the world over and hence in an Allied campaign they are interchangeable, which is a decided asset from a military point of view. We could fly British, French, or Italian planes with little or no preliminary training, but it is doubtful if we could have operated their vessels had the personnel situation demanded such an expedient.

The concentration of enemy submarines off the Irish coast made that area one of great importance, and accordingly after conferences with the British Admiralty it was decided that we should undertake the construction there of four large seaplane stations and one kite balloon station. From a political point of view it was considered by many in authority that it would be advisable for us to take over all aerial operations in Ireland, but this was not done. We did, however, carry out our agreement to construct and operate these five stations, from which many excellent patrols were made and at least one submarine accounted for.

It would seem from an examination of the chart of sinkings in this area that had these stations been in existence in the early days of the unrestricted submarine campaign the losses suffered would have been greatly reduced. During the month of April, 1917, more than one hundred vessels were sunk within reach of the aircraft which we subsequently had based on Ireland, but by the time our stations were in operation the submarine campaign had lost its effectiveness and was already doomed to failure. The fact that the British did not foresee the importance of establishing aerial stations in Ireland can only be explained on the grounds of insufficient personnel and material or as a strategical blunder on the part of the Admiralty staff. Certainly the creation of these five stations in 1917 would have saved millions of pounds and hundreds of lives.

The establishment of our naval air stations in France was brought about in a curious way. It will be remembered that the first American aviation unit to reach Europe landed in France on June 5, 1917, and consisted of six officers and sixty-three enlisted men in command of an officer of the rank of lieutenant.

This officer had written orders to proceed with his detachment to France and upon his arrival to keep the naval attaché in Paris advised of his whereabouts. Before leaving this country he sought further and more detailed information with respect to his duties, but was unable to obtain either instructions or advice except that if he wanted to go to the war zone he had better leave at once before a change of policy would revoke his orders. Accordingly, upon his arrival in Paris, he proceeded forthwith to enter into negotiations with the French Admiralty, during the course of which he agreed, on the part of the United States, to establish certain naval air stations on the French coast. This was done entirely on his own initiative, and even his presence in Europe was unknown to Admiral Sims until the subject was brought up for discussion at a meeting of the Board of Admiralty, when Admiral Sims was asked to explain the reason for his secretive policy in concentrating a large air force in France when the most vital areas of the enemy submarine campaign lay in and adjacent to the coasts of England and Ireland. In reply Admiral Sims was obliged to explain that the entire commitment was as much of a mystery to him as it was to them; that he had no knowledge of any officer being empowered to represent the United States in France; and, admitting the contention that England and Ireland offered a much more fruitful field for aerial operations against submarines, that he would investigate the matter without delay. To this end he summoned the lieutenant from Paris, and found that in the absence of any orders or instructions he had proceeded on his own initiative to commit the United States to the construction of the several naval air stations as shown on the diagram. In view of this it was considered that his assumption of responsibility and his display of initiative in doing what he did was most commendable.

And so it was that our air stations in France had their beginning. It is probable that had their establishment been the subject of a conference between the Allies and ourselves part of this force would have been diverted to England or to Ireland. As it was, however, these stations were very largely instrumental in driving the submarines from the French coast and in forcing them out to sea, where the concentration of shipping was less great and where in consequence less damage was suffered. Generally speaking, therefore, the concentration of our naval air

effort on the French coast was sound, but in excess of that which was justified by the exigencies of war.

Our aerial activities in the Adriatic began in the early winter of 1918, when, at the request of the Italian Government, we occupied the two Italian stations at Pescara and Porto Corsini. Obviously, our targets were the Austrian naval establishments across the sea, and, although these two stations were not completely finished when the Armistice was signed, we had already accomplished some very effective bombing flights from them and we were making our effort felt in that area.

With reference to our work in the Adriatic, the following dispatch from the chief of staff of the Italian Navy to the Italian naval attaché in London, dated August 25, 1918, is of interest:

> American aviation recently began its support for our operations in the Adriatic. An American squadron energetically attacked and forced to return to Pola Austrian aeroplanes met near the Istrian coast. During the pursuit one American machine was obliged to land but a very intrepid aviator took the pilot on board and destroyed the machine. Military works at Pola and especially aviation installations and submersible bases were bombarded by day on the twenty-first, during the night of the twenty-second, and at dawn on the twenty-third, by several Italian machines and some Americans. Four tons of explosives were dropped and numerous explosions and fires were seen. One of our hydroplanes is missing. Large Italian squadrons twice bombarded Durazzo on the same day and dropped 1,500 kilogrammes of explosives on military works starting large fires. Also bombarded military works at Curzola. British aviation units continued to attack Cattaro, damaging bridges, hangars, submersible stations and railway station at Zelenika. Enemy chaser machines undertook some futile counter-operations. We made vigorous counter-attacks, one enemy machine fell in flames and another was obliged to descend. One British machine missing. Enemy aviators attempted to rally. A few Austrian planes on the night of the twenty-first, dropped thirty bombs on Venice, one killed and three wounded, no damage to military works. One dead and four wounded at Cortellazzo attacked the same night. Five enemy machines again attacked Venice on the night of the twenty-third. Dropped a few bombs, no damage done, one civilian slightly wounded. During the night of the twenty-second, there was raid on Porto Corsini. Some damage to military establishments, six civilians wounded. Other attacks on Fiume, no damage. Our efficient anti-aircraft fire compelled the enemy machines to fly very high making their bomb dropping ineffective. One enemy seaplane was forced to come down near Lido. The crew of three was captured.

Entirely aside from the military advantages gained, our presence in the Adriatic was of the greatest value in maintaining the

morale of our Italian Allies, and again our acceptance of the offer to occupy these two stations gave us a foothold in that area which would have been greatly strengthened had the war continued.

Of all our aerial undertakings in Europe, the most ambitious and the most enterprising was the establishment of the "U. S. Naval Northern Bombing Group," which was created for the purpose of bombing enemy submarine bases on the Belgian coast, particularly Ostend, Zeebrugge, and Bruges. As originally planned this unit was to consist of twelve squadrons of bombing and fighting planes, of which four squadrons were to be operated by Marine Corps personnel. In addition, it called for the establishment of an assembly and repair base. This was eventually created at Eastleigh, England, the outfitted planes flying across the Channel to their fighting base. In a subsequent decision of the Navy Department the complement of this group was reduced to eight squadrons, four day and four night, only a part of which had been assembled when the Armistice was signed.

Inasmuch as the planes used by the personnel of this group were of the land type and similar to those used by the army, there was considerable criticism from certain quarters of our having undertaken work which belonged to the army. It is quite true that the planes used were of the army type, because they were best suited to the work in hand, but that we did not encroach upon the army is fully confirmed by the following extract from an official letter addressed to the Secretary of the Navy by the Secretary of War under date of April 10, 1918:

> Referring to the confidential memorandum on Dunkirk-Calais on operations against submarines and the inquiry contained in paragraph 3, the War Department agrees with the Navy Department in its decision that the extension of operations against submarines in their bases as recommended from abroad is purely naval work.

This letter went on to discuss arrangements for the supply of fighting aeroplanes to the navy by the army and other pertinent subjects.

In fact, the topic that occupied the greatest space in all of our communications was the obtaining of aeroplanes. This was the greatest problem of all, and one not fully solved even at the close of hostilities. So little, indeed, did the output of planes keep pace with our construction work that the greater part of the bases were completed months before the planes were received. We

tried to remedy this state of affairs by placing contracts with the Italian Government, which contracted to supply us with a number of bombing planes, for which it was to receive in turn cargoes of raw materials such as iron, lumber, etc. These contracts were consummated and some of the planes were delivered, but they proved unsuited to our requirements. The attempt was made to deliver these machines by air from Milan, Italy, to Flanders, but a large proportion were unable to stand this test and were crashed. This, however, was not strange for it meant crossing the Alps—a hazardous undertaking, but one more than justified by the necessity for immediate delivery of the planes.

The personnel of this unit, however, had not been idle in the meantime, for they were billeted as reinforcements with the French and British squadrons operating in the Flanders area, with whom they carried out many highly successful flights, during which they dropped about 100 tons of explosives on enemy objectives.

The group began active operations on its own initiative on October 14, 1918, at which time a raid was made on enemy railway lines at Thielt, day and night raids being made until October 27, eight raids in all being carried out. The "mission" of the Northern bombing group, however, was accomplished by the evacuation of the enemy's naval bases on the coast of Belgium. The naval situation in that area was, therefore, of an entirely satisfactory nature, but as conditions on land were not so satisfactory it was decided that the Northern Bombing Group should continue to operate in conjunction with the Allied armies in Flanders until the crisis that existed should have been overcome.

In a letter to the British Admiralty, dated October 15, 1918, Admiral Sims refers to this situation as follows:

> Although the commander of the U. S. Naval Northern Bombing Group has reported his command to the Vice-Admiral commanding the Dover Patrol for orders and is, therefore, nominally under his command, the U. S. Naval Northern Bombing Group is at the present time operating under the orders of the officer commanding the 5th Group, Royal Air Force.
>
> It is proposed, with your concurrence, that during the present offensive this U. S. Naval Aviation Unit should continue to operate in conjunction with the Royal Air Force Units for the destruction of those objectives possessing the greatest strategic value and as indicated by the Commander of the 5th Group, Royal Air Force.

This practically places the U. S. Naval Northern Bombing Group under the command of the 5th Group, Royal Air Force, and, inasmuch as I understand this to be entirely satisfactory to the Vice-Admiral commanding the Dover Patrol, I do not hesitate to express my entire agreement with the existing arrangements and sincerely trust that they will meet with your approval. I think the close co-operation established between the U. S. Naval Aviation and the Royal Air Force Units in this area will result in combined offensive raids against enemy objectives with excellent effect.

There are at the present time in operating commission three *Capronis,* four *D. H.-9a's* and seven *D. H.-4's* actually operating under the command of the U. S. Naval Northern Bombing Group. In addition, ten *Handley-Pages* and nine *Capronis* are expected to be in operation within the next three weeks with a minimum delivery of ten *Capronis* per month thereafter. We are now engaged in the assembly and erection of fifty-four *D. H.-9a's* and fifty *D. H.-4's,* all of which will be allocated to the Northern Bombing Group as rapidly as they are ready for offensive operations against the enemy. In addition, there are 100 *D. H.-4's* in course of construction in the United States, upon which work is being rushed as much as possible.

Due to certain extenuating circumstances, it is impossible at the present time to give you exact dates when these squadrons will be completely organized and ready for duty. I shall, however, inform you in the course of the next week of probable dates which will, it is sincerely hoped, be realized.

It will thus be seen that, although the Northern Bombing Group was originally created to exterminate the submarines from the coast of Belgium it eventually wound up as a part of the British Army in the great drive of 1918, but not until after it had been offered to General Pershing and declined on the grounds that it could be used to greater advantage where it was and in conjunction with the British. During this drive it advanced successively from the operational command of the British vice-admiral commanding the Dover Patrol to that of the French admiral commanding the Flanders area, until it was finally placed under the orders of the Belgian authorities into whose command it had advanced and with whom it operated until the Armistice was signed.

Having reviewed briefly the reasons governing the strategical employment of our Naval Air Forces as of the time of the cessation of hostilities, it may be appropriate to outline what our plans for the future were when the war came to an end.

By the end of September, 1918, we had concluded conferences

with the French, British, and Italian Governments as a result of which we had urged certain recommendations to the Navy Department, of which the following is a summary:

1. That seaplane operations from U. S. stations already built or authorized should continue with the exception of Dunkirk and without consideration of the Italian seaplane stations which will be the subject of conference with the Italian Government. The character of the operations to be adjusted to operating conditions.

2. That the principal augmentation of our air effort should be in bombing squadrons, the mission of which shall be the destruction of enemy naval bases, especially submarine bases.

3. That naval bombing squadrons shall be composed of day and night bombing aeroplanes of the land type augmented as necessary by protecting squadrons of fighting aeroplanes of the land type.

4. That in aircraft for fleet use each navy shall proceed as it deems most desirable.

5. That conference with the Italian Government shall determine future American and British air effort in Italy with especial reference to the Adriatic area but that it is highly probable that British bombing operations against enemy naval bases in the Adriatic shall be taken over and augmented by the U. S. Navy in co-operation with the Italians. The British forces thus released to augment British forces in the Aegean Sea. Subject to further investigation this will probably require twelve night squadrons, six day squadrons and a few squadrons of fighting planes.

6. That planes and production be started at once with which to begin bombing operations against enemy naval bases in and near the Heligoland Bight.

These recommendations met with the approval of Admiral Sims and of the Navy Department, the latter and the final authority, however, specifying that seaplanes only should be used in the Adriatic. No explanation of this decision was ever vouchsafed to us and in our opinion the efficiency of the entire project would have been reduced by at least twenty-five per cent had we been obliged to use seaplanes instead of land planes for operations in that area where the over water distances were small.

One further point in connection with these recommendations which is of interest from an historical point of view is the fact that they were approved and cabled to the Navy Department on September 30, 1918; this shows how little we expected armistical proceedings at that time.

The work of the U. S. Naval Air Force was all the more remarkable in that it was in the main accomplished by men who had

no previous training or experience in aviation. In fact, the majority of the personnel was drawn from the Naval Reserve Force, recruited from every phase of civil life. No words can adequately convey the enthusiasm and devotion of these young men. It is an interesting commentary on their spirit, that, almost without exception, those who enrolled begged for billets at the stations where the service was most arduous and dangerous.

From its conception until the summer of 1918, the U. S. Naval Air Force, Foreign Service, was an independent command with its administrative executive located in Paris. As its activities expanded, however, to include England, Ireland, and Italy, it was considered advisable to amalgamate it with those other forces which were operating under the direct personal control of the commander of the U. S. Naval Forces operating in European waters. This change was accordingly made, and as aide for aviation the administrative director was located in London in immediate contact with his direct superior. Here a large subdivision of the staff was created which counted in its organization more than fifty officers with appropriate clerical assistance. These officers were, for the most part, technical assistants representing the several bureaus of the Navy Department. No direct orders were ever issued from London, as this authority was delegated to those detachment commanders under whom our air units operated. Obviously any other procedure would have been impossible. Our naval air station at Killingholme, for example, was placed under the operational orders of the British vice-admiral commanding the defenses of the east coast of England, and any specific orders which we wished to have transmitted to its commanding officer affecting its military control were transmitted via the British Admiralty. This principle was, in effect, the same as that upon which our destroyers based on Queenstown were operated. In all administrative respects, however, the stations maintained their identity as American units.

The functions then of the Aviation Section of the Force Commander's staff were to create, supervise, and to co-ordinate the efforts of the whole. As reinforcements became available from home, the subject of their most advantageous employment would be laid before the Supreme War Council, of which Admiral Sims was a member, and the decision in turn transmitted to the Aviation Section for execution.

No account of the wartime activities of our Naval Air Force would be complete without a brief mention of the fusion of the British Royal Naval Air Service with the Royal Flying Corps to form the Royal Air Force. This amalgamation, or more properly speaking this annexation, of the Naval Air Service by the army took place on April 1, 1918, and was perfectly sound and fully justified at that time. The navy was, so to speak, resting on its oars; the submarine campaign was already doomed to failure and the German High Seas Fleet was powerless. On the other hand, the enemy was very far from defeat on land, and all possible reinforcements were needed to bring about a victory in this quarter. It was, therefore, perfectly logical that the Naval Air Service should have been called to the support of the hard-pressed army, and the easiest way to accomplish this was to amalgamate. It was in effect a virtue of necessity, and the Admiralty acquiesced with such grace as only true sportsmen can muster in the face of necessity. The very life of the Empire was at stake, and no sacrifice was too great to make for its salvation. And so the Admiralty sent its Naval Air Service as reinforcements to the army, but whether they were given or only loaned time alone will tell. To date the Royal Air Force is still in existence, but I venture the belief that in the heart of every British naval officer is the firm hope and conviction that eventually the Royal Naval Air Service will be returned to its own.

Although there can be no doubt that, for military reasons, the British were justified in amalgamating their air services when they did, for political reasons they were most anxious to have us do likewise and by so doing rout the critics of this new scheme. To this end several missions were sent to Washington to lay before the authorities there the advantages to be gained by such action. Fortunately for us, however, both Admiral Sims and General Pershing vigorously opposed amalgamation, and in view of this powerful opposition it did not take place although there were and for that matter there still are strong influences at work to bring it about. We may, at some future time, be forced to amalgamate just as the British were, in order to save the nation from defeat, but to do so before that time comes will seriously handicap the navy, and more especially the fleet, in its operations as a unit. Soldiers cannot run ships, nor can sailors run an army, and there is as much difference between naval and military

air strategy and tactics as there is between the ship and the regiment.

And now, in conclusion, I desire to invite serious attention to the very important aspects of the late war in their relation to the employment of aircraft. In the first place, the naval war—the combat between surface craft—was practically over before the perfection of aircraft made that weapon one which must be taken into account in naval battles of the future. Had the British, or the Germans, possessed planes capable of carrying bombs of 1,000 pounds capacity and more, the story of Jutland might, and very probably would have been, a very different one from that which now stands. The sinking of the ex-German ships by U. S. naval aircraft in the summer of 1921 was a very impressive lesson and one to which we must give heed in anticipating the future. It was demonstrated at that time that the destructive effects of our aerial bombs were even greater from an underwater explosion than from a direct hit, so that to those critics who say that aircraft cannot hit the target this knowledge must come hard. As a matter of fact, aircraft can hit, not with the same degree of precision that the great guns hit, but much more accurately than our navy could in 1898. Aerial gunnery is now in the process of transition from the infant state to that of maturity, and it is only a question of a very short time until bomb dropping from aircraft will be accomplished with the same skill and dexterity as is now expected and in fact demanded of our warships in their target practices.

With respect to gas warfare, the possibilities are almost unlimited. Gas bombs have been perfected which explode upon contact with the water, against which the surface craft of today is impotent. This phase of aerial warfare then offers a tremendous field of employment unless poison gas is really prohibited in the next war.

In the second place, the progress which has already been made in aviation since 1918 makes our efforts of only four years ago seem almost crude in their simplicity. In 1914, the aeroplane was a toy; in 1918, it was a recognized weapon of legitimate warfare; and who can predict its future? A few very far-seeing and still intellectually-young men know what it will be, but unfortunately for us the majority are not only critical but exceedingly skeptical of this new arm of the service.

The Great War was almost lost by the Allies because of the fact that they could not, or would not, or in all events that they did not appreciate the military value of the submarine until it was almost too late—until the First Sea Lord of the British Admiralty was forced to admit to Admiral Sims in April, 1917, that "the Germans will win unless we can stop these losses—and stop them soon."

In order, therefore, to preclude the possibility of any nation or combination of nations reproducing a similar state of affairs in the next war with aircraft substituted for, or at least augmenting its submarine effort, it behooves us to give aviation full credit for what it has already accomplished and to view its future with optimistic fairness and with an open mind.

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IS THE FLEET STRATEGICALLY CONCENTRATED?

By Commander F. M. Perkins, U. S. Navy

I

"There is thus a concentration of mental and moral outlook, of resolution, as real as the physical concentration of disposable forces."—Mahan.

"Like every sound principle, concentration must be held and applied in the spirit, not in the letter only; exercised with understanding, not merely literally."—Mahan.

Before the Panama Canal was undertaken, and during the period of its construction, there were frequent revivals of the question of dividing the fleet between the Atlantic and Pacific. The influences which sought to divide it were mainly political in their origin as were also others which strove for its retention in the Atlantic. The latter, in themselves the stronger of the opposing influences, had the weight of professional opinion in their favor, largely guided by the constant warnings of Mahan and other officers of the navy who clearly read the teachings of naval warfare and accurately pointed the way toward applying their principles.

Not only did the general teachings of naval history demand the retention of our navy in the Atlantic but the specific factors which composed the international situation in the years before the existence of the Canal and the outbreak of the World War dictated the same course of action.

The outstanding features of this period affecting the disposition of our fleet were the rapid growth of the German navy and its advancement to second place in the navies of the world, German commercial development in the Central and South American republics and the impending struggle between the mistress of

the seas and her self-announced rival, foreshadowed by the gradual concentration of the British navy in and about home waters.

The commercial expansion of Germany in South America had been no less rapid than her naval expansion at home. Their simultaneous growth was, in fact, interdependent; each was supplementary to and promoted the other. The larger navy afforded protection to the larger merchant marine and inspired German merchants with the confidence necessary for embarking on vast commercial conquests; the larger merchant marine was the carrier of the wealth which made the larger navy possible. The rich, undeveloped continent of South America was the mine which in large part contributed to both and from which Germany was rapidly quarrying the foundation stones upon which she proposed to rear her structure of world commercial and military dominion.

Her commercial colonization of South America, if not actually intended to develop into immediate political colonization, threatened, by its thoroughness and rapidity of growth, eventually to become as effective as if it were political in fact and gave promise of bringing up many delicate political problems in the future.

Between Germany and her rapidly materializing South American dreams stood the nominal barrier of the Monroe Doctrine of the United States which was and is and always will be equal in actual force to the strength of the navy of the United States —but no stronger. The navy of the United States at this time was, numerically, a poor third. Fortunately, England's interests and those of the United States lay in the same direction and for years not the Monroe Doctrine, not the American navy, but the navy of Great Britain was the real barrier which interposed between Germany and German territorial acquisitions in South America.

These, then, were the deciding factors which dictated the concentration of the United States fleet in the Atlantic. True, there were occasional rumblings in the Pacific and frequent demands from the West Coast states for a part of the fleet but they were without sufficient influence to effect the division. The center of the next storm area was rightly judged by the government to be in the Atlantic and there, by the decision of the Navy Department upheld, perhaps, by the political influence of the Eastern seaboard states, the fleet remained.

It is probable that the opening of the Panama Canal would have resulted in the early division of the fleet between the Atlantic and Pacific had it not occurred almost simultaneously with the outbreak of the World War, for with the completion of the Canal tactical division became possible without sacrificing strategical concentration, within the ordinarily accepted meaning of the latter term.

The division of the fleet between the two coasts of the United States was postponed for several years by the World War. With its close came a vast re-arrangement of world forces, political, military and economic. The great High Seas Fleet—the German navy—was no more. Vanished also was the great German commercial web which was being spun so rapidly and efficiently about South America.

For the first time in centuries Great Britain accepted the idea of a naval equal on the seas. This same equal had, in an inconceivably short time, developed a merchant marine from almost nothing to one which threatened the supremacy of England's mighty commercial fleet. For the United States the Atlantic atmosphere was cleared.

But the same world upheaval, which had so greatly enhanced our military and commercial prestige and had solved our problems in the Atlantic, had, simultaneously, added to the military and commercial prestige of a possible rival in the Pacific. The contemporaneous growth of United States and Japanese merchant shipping in the Pacific, the award of the German Pacific Islands north of the equator to Japan, the cession of Shantung, the prolonged Japanese occupation of Siberia and Sakhalin Island, the great naval building programs of the United States and Japan were new factors and their possible bearing upon the great British, French, American, Japanese, and Dutch eastern colonial systems, together with the still troublesome question of Oriental immigration in the United States, combined to shift world interest from the Atlantic to the Pacific and to center national and international attention upon the new situation created, and especially upon the new significance of the Open Door in China.

This new Pacific situation together with the vitally important strategic fact of the existence of a successfully operating Isthmian canal silenced the political guns of the proponents or an

all-Atlantic navy and removed serious professional objection to the division of the fleet. Perhaps the great size of the navy, built and building, removed the fear that Atlantic navy yards might be left without work and thereby helped to quiet political opposition; possibly it became necessary to focus the Congressional attention upon the inadequacy of the West Coast navy yards against the day when they might be called upon to maintain the reunited fleet or to launch it forth into the Pacific; perhaps it was considered that, with the completion of the 1916 building program, we would actually have two principal fleets and that the time had come to take the first step in establishing them. Whatever the cause or causes may have been, the much discussed and long contemplated creation of a Pacific fleet of first-class ships followed closely upon the heels of the new situation.

In the summer of 1919 the fleet was divided into the Atlantic and Pacific fleets of approximately equal numerical strength, each with its own battleships, destroyers, submarines, auxiliary vessels, and aircraft. Since then the distribution of forces between the two has been modified by a gradual strengthening of the Pacific fleet at the expense of the Atlantic, but the underlying idea of two fleets, one in the Atlantic, the other in the Pacific, still remains the basis of the organization of the navy in theory and the distribution of the fleet in fact, apparently accepted unquestioningly as tactically, strategically and administratively sound, both by the professional thought of the navy and the lay thought of the country at large. And yet, although divided in two fleets for peace purposes, the necessity for concentrating them in time of war is recognized by providing an organization for combined operations.

This very brief review of the outstanding events and circumstances which preceded the division of the fleet and led up to its present distribution is but preliminary to the question which it is the purpose of this paper to discuss.

II

"Is the Fleet Strategically Concentrated?"

At first blush, it would appear that to ask this question is to answer it.

The writer has no desire to attempt to qualify as a naval strategist, for he has not, as yet, had the advantage of War Col-

lege training. His desire is to invite consideration of the subject of the strategical concentration of the fleet from a point of view which endeavors to be somewhat broader and more inclusive than that which is ordinarily accepted as the academic point of view of strategical concentration and this, without sacrifice or compromise of any of the essential truths which guide but possibly also limit the trained strategist in the field of pure strategy.

He comes, therefore, not as the bearer of a message but, humbly, as a seeker of truth, hoping that others more capable may point out the error of his ways and allay the doubts and misgivings which have arisen in his own mind concerning the strategical concentration of the fleet.

Through the reading of various books on naval strategy and similar subjects there has gradually developed in the mind of the writer a conception of the term "concentration," as applied to warfare, which comprehends many more factors than those of position, distance and speed and which assigns to "concentration" many other first cousins than "central position," "interior lines," and "communications."

This broader conception of concentration gives to it great elasticity and endows the idea with the ability to clarify and illuminate many little problems of everyday life as well as those of wider meaning. It serves, for example, as a guide to the mind in arriving at a correct decision concerning the distribution of a few individuals for accomplishing a given result no less than it serves as an aid to correct reasoning in arriving at a decision concerning the tactical or strategical distribution of a fleet for accomplishing a given mission.

According to this conception, concentration—"strategical concentration"—is not merely a geographical matter concerning factors entirely measurable upon a chart, but true strategical concentration, in addition to the factors of positions, distances and speeds, includes many others which are just as truly a part of strategical strength and upon which strategical concentration just as truly depends.

Strategical concentration, in other words, is not realized in its entirety merely because two detachments of a fleet or force occupy such positions with relation to each other and to the enemy that they may join and reinforce each other without danger of becoming separately engaged. This would be a very narrow

view of strategical concentration and yet it is one against which we must be on guard. Strategical concentration in its widest application should include consideration of many factors other than the distribution for ready physical mobilization, factors which, in time of peace, are being developed for the purpose of adding to the strength of the fleet in time of war.

After discussing the subject of concentration and illustrating his meaning by historical examples, Mahan issues a specific warning against accepting a too narrow interpretation of the term. In pointing out that concentration means mutual support, that mutual support does not necessarily imply direct contact but that "a considerable separation in space may be consistent with such mutual support"; he says:

"Like every sound principle, concentration must be held and applied in the spirit, not in the letter only; exercised with understanding, not merely literally."

The wide applicability of the idea of concentration "in the spirit" is illustrated occasionally by Mahan in his various writings. For example: "The same consideration (concentration) applies to ship design. You cannot have everything. If you attempt it, you will lose everything; by which I mean that in no one quality will your vessel be as efficient as if you had concentrated purpose on that one. On a given tonnage—which in ship-building corresponds to a given size of army or of fleet—there cannot be had the highest speed, *and* the heaviest battery, *and* the thickest armor, *and* the longest coal endurance, which the tonnage would allow to any one of these objects by itself."

Again, in discussing Rojesvenski's dispositions before the battle of Tsushima, Mahan points out that the Russian admiral labored under self-imposed tactical handicaps which were the result of a strategical blunder which, in turn, resulted from a "lack of unity of conception, of that exclusiveness of purpose which is the essence of strategy."

What are "unity of conception" and "exclusiveness of purpose" but the principle of concentration "applied in the spirit"?

Rojesvenski's mind was divided between battle and escape. He overloaded his vessels with coal, reducing their speed and lessening their maneuvering ability. He took his train with him and suffered the resulting tactical embarrassment. He failed to *concentrate* on the idea of battle; he failed to *concentrate* on the

idea of escape. He did not even concentrate on a combination of the two ideas and form a suitable plan for carrying out that one which opportunity should favor. He lacked exclusiveness of purpose, concentration; he compromised—and lost.

These two examples, to which might be added many more, serve to point the way toward appreciation of the wide application of the idea of concentration in its military sense to other things than positions, distances and speeds and to show that true strategical concentration comprehends far more than a distribution of forces which enables them to concentrate without danger of being beaten in detail. It includes "unity of conception," "exclusiveness of purpose." It includes concentration of ideas, the habit of concentration of thought.

"*There is thus a concentration of mental and moral outlook, of resolution, as real as the physical concentration of disposable forces.*"

We should bear in mind that even the narrowest and most academic point of view of concentration refers to the concentration of *force,* not necessarily synonymous with concentration of *numbers;* therefore if the division of numbers operates to weaken or lessen the force which any detachment in itself should be capable of contributing, the distribution, although it may be geographically correct, is strategically unsound.

True concentration, then, includes not merely the ready mobilization of the fleet but it presupposes, as its very essence, the complete readiness of the fleet to develop at the moment of mobilization the maximum offensive power of which it is or should be capable.

Such complete readiness is based upon many factors which are in daily process of growth, stagnation or disintegration; factors which are elements both of tactical and strategical strength; factors upon which the entire battle fleet must be daily concentrating with "unity of conception" and with "exclusiveness of purpose."

These factors might be greatly varied and extended; the writer conceives the essential ones to be: 1. Leadership; 2. Loyalty; 3. Discipline; 4. Fleet spirit; 5. Training.

III

Leadership:

If the history of naval warfare teaches any one lesson which stands out from all others, it is this: That the character, spirit, ability and example of the commander-in-chief far outweigh any other factor on the day of battle. As a corollary of this proposition it need only be stated to be accepted that his influence will be felt throughout the fleet according as his commanders, his captains, and his officers understand his character, are endowed with his ability, inspired with his spirit, and capable of intelligently interpreting and following his example. This was the main-spring of Nelson's genius and it came about not through mere casual association with his subordinates, but through his deliberate cultivation of their acquaintance and his persistent, personal instruction in his own ideas.

The genius of leadership is partly inborn, partly acquired. Whatever its source may be, it is indisputable that it can reach its full growth and exercise its full control only when those through whom it must be exercised are capable of receiving, transmitting, and putting into action its commands; quickly, accurately, intelligently, and sympathetically.

Especially is this necessary in naval battles, which may be won or lost in minutes, where tactical plans are certain to be modified and perhaps entirely changed to meet the rapidly changing situations; where the issue may depend upon the initiative of a subordinate commander who must act on the instant without time to communicate with the commander-in-chief.

Not only should the commander-in-chief have commanders and captains who thoroughly understand his own ideas and methods, but he should, himself, through personal acquaintance with them have an intimate knowledge of their individual characters, capacities and special abilities, as well as their weak points.

What commander-in-chief, upon being joined by half his battle fleet on the eve of battle, would not wish that he might have had its commander and subordinate commanders and captains under his personal training and observation, not for a few days or weeks but for many months—yes, or years? What would he not give to know through previous personal contact, the characters and special abilities of his newly joined subordinate commanders

and captains as well as he knows those with whom he has been serving? A crisis arises in the battle. A special situation demands special action, perhaps not provided for. The unexpected happens. Who will best meet the emergency? Who will understand intuitively his wishes expressed in the least number of words when the life of the nation is being measured by seconds? Which division commander has cool judgment in a crisis? Which one must be given detailed instructions? Is there one to whom a word will tell everything? Is he determined, resolute? If the situation again changes, will he know what to do? It may be there is dangerous work for a destroyer squadron. A desperate chance must be taken. The work to be done is clear. Judgment is not required as much as dash, reckless daring. Who will best meet these requirements? And so on.

These are real situations. Great battles are filled with them. Campaigns are filled with them.

Indoctrination will facilitate the work of the commander-in-chief; it will not replace intimate knowledge of the characters and special abilities of his subordinates. Nor will it replace knowledge and understanding on the part of subordinates of the character, methods and ideas of the commander-in-chief. Such mutual knowledge and understanding can be gained only by intimate and continued association. Indoctrination gives us all the same point of aim; it does not reduce us all to a common caliber nor assign us all the same muzzle velocity. We are not standardized and until some method is discovered of standardizing character and reducing human talents to a common denominator, we never *will* be standardized. Personal knowledge on the part of the commander-in-chief of the character and abilities of his commanders is not an imaginary asset. The history of fleet actions proves that it is not. To a great leader it is as real an asset as the commanders themselves and the ships which they command. Can this knowledge be gained when part of the fleet is in the Atlantic and part in the Pacific except for brief periods each year? Can circular letters and general orders and all the forms of organization that departmental ingenuity can provide, weld into one inspired whole for the day of battle, a fleet divided by thousands of miles and under two commanders-in-chief in time of peace? *Are we concentrated on leadership?*

IV

Loyalty:

Loyalty is of two kinds: that which we give involuntarily because of affection or admiration for an individual and that which we give more deliberately because of our respect for the office which he holds.

The first is born of an influence which the individual exercises over us through some indefinable attribute which, for want of a better term, we call charm, personal magnetism. The fortunate leader who possesses this quality commands our loyalty doubly; we render him not only the loyalty which is due out of respect for his office but also the personal loyalty which he inspires.

The second is born of military training and of allegiance to a common cause. He who would command a full measure of loyalty to the office which he holds must exercise the duties of that office in a way to command respect and must uphold the high traditions to which he is heir.

The leader who inspires our personal loyalty does so largely by virtue of his opportunity for knowing us and of our opportunity for knowing him. We must feel his living presence to be inspired; even the most humble of us must occasionally have the opportunity of seeing him in the flesh. The flower of personal loyalty thrives in the soil of admiration and affection when cultivated with a human, personal touch. It flourishes in the warm air of personal acquaintance, but it dies in the cold, dry atmosphere of aloofness, distance.

The leader who does not possess the inborn gift of inspiring personal loyalty may aspire to develop it in some measure by deliberate effort. His high office carries with it our respect, our deliberate loyalty. Through the execution of the duties of his office he may soon command our admiration and this, in time, may ripen into a sense of personal loyalty which approaches in depth of feeling that given through affection. But it is a plant of slow growth. It is not readily susceptible to forcing. Its essentials are time and the opportunity for personal attention, acquaintance. Its enemies are aloofness, coldness, distance.

Can the spirit of fleet loyalty to the one and only leader who can command in chief on the day of battle reach its full devel-

opment with the fleet maintained in two detachments several thousand miles apart? Will the fleet, which finds itself suddenly become a fleet on the eve of battle, be inspired by complete personal loyalty to a commander-in-chief who has theretofore commanded only a part of it? *Are we concentrating on loyalty?*

V

Discipline:

The quality of the discipline of a ship's company is invariably a reflection of the aptitude for command of the ship's captain.

If an able captain has indifferent officers with which to work he will encounter difficulty in bringing his crew to the state of discipline which he desires, for he must first instruct and, possibly, discipline his officers but, in the end, his standards will prevail and become those of the officers and crew. They may be somewhat modified by the handicap under which the captain works but, eventually, the tone of the ship will be that which he gives it.

If a captain of little or indifferent aptitude for command has an excellent set of officers under him the slack standards which he sets will prevail and become those of the officers and crew. They may be somewhat modified by the efforts which his officers will make for a while but finally they will tire and the tone of the ship will be that which he gives it.

These things are true of any organized activity; commercial, military or naval. Especially are they true of ships where the leader, the captain, lives in such daily intimacy with his men; where his authority is so supreme.

As the officers and crew of a ship reflect the standards of discipline set by the captain, so do the captains of a fleet reflect the standards set by the commander-in-chief, modified only by their varying abilities and aptitudes for carrying out his wishes and by the extent to which they, themselves, are disciplined.

There are many ideas of what constitutes a proper state of discipline and varying methods of acquiring it. The appearance of ship's boats, the quick stand to attention, the smart salute, quietness, order, precision, are the outward forms which, to some, indicate a proper state of ship's discipline. Others are content

with less of form and look elsewhere for the tell-tale signs of discipline; they read it in facial expressions, in the tone of the voice, in idle conversations. They are content with the spirit of discipline if the form is not altogether outraged.

Actually these two ideas are not altogether opposed nor are they incompatible. They are, in a degree, complementary and are often co-existent in the same ship and with excellent results. They are simply manifestations of the differences in individuals and of their different ways of accomplishing the same result. The "sun-downer" and the captain who holds the personal affection of his entire crew may get an equal number of hits on the day of battle. Between these two extremes are found varying temperaments in which both tendencies exist, one or the other predominating or the two, perhaps, reaching a balance.

It is fortunate that captains do not have to lean to one extreme or the other to be successful; it would be very difficult, indeed, to find enough out of one mold to supply the fleet. "Different ships, different long splices"—and most of the long splices hold up under strain.

It goes without saying that discipline, in the sense of punishments and reprimands, must be fair and impartial. But there is another underlying principle equally important—consistency. The captain who rules with a rod of iron must maintain that rule consistently to maintain the respect of his officers and crew. This does not mean that he may not have his human moments, that he may not commend good work, that he may not even look pleasant. It does mean that he shall not be harsh or strict one day and lax the next in his punishments, his methods and his bearing, for his laxness will be interpreted as weakness and he will lose his grip on officers and crew.

Similarly, the captain who rules largely through the personal affection of officers and crew may not indulge in too frequent bursts of temper. This does not mean that he may not be strict on occasion or severe in his reprimands or punishments when necessary. It does mean that he shall not be too changeable; pleasant one day and harsh the next, or he will forfeit that which constitutes the greater part of his natural aptitude for command.

Now all this apparently has very little to do directly with the question or the strategical concentration of the fleet. But

it is for the purpose of showing that, whatsoever the means of bringing a large organization to a satisfactory state of discipline, the guiding principle is consistency, uniformity, "exclusiveness of purpose," concentration.

As it is in a ship, so it is in a fleet. Consistency and, as far as obtainable, uniformity of standards must obtain to develop the highest state of discipline. Limited only by the capacities of its several captains, the standards of discipline of a fleet invariably reflect the standards of its commander-in-chief. Since human beings are what they are it is inevitable that a divided fleet will have divided standards of discipline. Will not such divided standards, developed and maintained through years of peace, serve to lessen the effective power of a fleet united in time of war? *Are we concentrated on discipline?*

VI

Fleet spirit:

The spirit of a fleet is a subtle, intangible thing, difficult to define. To analyze it, subdivide it, classify its component parts and properly tag each one requires the skill and knowledge of a trained psychologist and, unless he himself has lived in and been a part of the fleet, he is apt to go wrong.

It does not, however, require a trained psychologist to be able to realize the fact of the existence of this very real thing which we call fleet spirit and to observe its effects. One need not have studied psychology or even know the meaning of the word to realize that the spirit of the fleet has a very definite and recognizable character of its own, or to be able to perceive that its influence is all-pervading and all-powerful; more powerful at times than the most ironclad order which the commander-in-chief may issue.

If the President of the United States, himself, in his capacity as commander-in-chief of the navy, should issue the most stringent order he could indite commanding the fleet to be cheerful, to carry on its maneuvers, drills, and daily routine in a happy, cheerful, joyous manner and the spirit of the fleet said "No!" all the deliberate and willing effort which the President's order would unquestionably call forth would be futile until the opposition of Old Man Fleet Spirit had been overcome. Once

overcome, however, he would be the most powerful friend and ally possibly obtainable. He would read the fullest meaning into our commander-in-chief's order; he would illuminate it; he would show us new ways of complying with it; he would inspire us to try to outdo each other in putting it into effect. And on his part the commander-in-chief of the fleet would find his work vastly simplified for he would feel that to issue his orders would be to have them carried out gladly, sympathetically, and completely.

Nowadays our old friend fleet spirit is more commonly called morale or fleet morale. Sticklers may claim that they are not synonymous but, to all intents and purposes and with the possible exception of some very delicate distinctions with which we are not concerned, they convey the same meaning.

A healthy fleet spirit—or morale, if you will—is the outgrowth of contentment brought about by the resultant effect of many and various forces. Its origin and source must be outside of and higher than the fleet itself. The writer has no intention of attempting to dissect and classify its many factors. It is sufficient merely to point out that the final development of a real, live, active, inspiring fleet spirit, is of slow growth; that it is of very complex structure toward which a thousand and one things contribute; that it is not amenable to hot-house methods of cultivation; that it can be killed or injured by the kindness of its best wishers through over-attention, and that it thrives best in an atmosphere which provides for a slow but steady, progressive, normal growth.

Fundamentally it is rooted in the feeling and attitude of the whole nation toward the navy as sensed by the fleet in what it sees, hears and feels. It is affected by an *entente cordiale,* or absence of it, between Congress and the Navy Department. It is fostered by a wise and consistent policy inaugurated and carried on by the Navy Department and from these principal sources it has countless ramifications which reach down to the things which affect the mental, moral and physical welfare of the individual sailor-man.

We who cannot analyze it from the viewpoint of psychology have at least observed some of the causes and effects of fleet spirit. We have observed, for example, that different fleets or

squadrons have different characters, no less than different ships; that one organization may be indifferent, uninspired, lacking that indefinable something which might unify it and make it a living thing instead of a mere collection of ships. We have observed other organizations in which the existence of a living spirit was shown in a thousand ways. Something about the ships seems to breathe it as they steam into the harbor and let go together; the smile on the face of the bow man shows it when one of the newly arrived captains comes alongside to pay his call; the rapid disappearance of the coal or stores from the lighters proclaims it; the faces, the conversations, the dress, the bearing, the alert, confident manner of the officers and liberty parties on shore speak of the existence of some controlling, unifying, compelling community of interest which seems to animate every member of the organization. It is the spirit of the fleet.

Such a spirit is not the product of this thing or of that. It is not the result of circular letters, free moving pictures, prophylaxis and ice cream on Sundays. A discordant, unhappy family cannot be made contented and happy by the purchase of a player-piano, an automobile and a radio set. These things have their value when applied at the right time and in the proper proportions; they also have very definite limitations.

The fleet, spiritually, is a family. Its spirit—atmosphere, tone—is the result of contentment brought about by mutual acquaintance, identity of interests and of experiences; by understanding which comes only by sharing together hardships, good times and bad, work, play and danger; by "sticking it out" together; by the mutual sympathy which is born of intimate, continued, personal acquaintance. Above all, the tie that binds is acquaintance and all that it promotes and fosters. Time and the opportunity for developing the family tradition are essential to the growth of the fleet spirit. Long cruises in company, common adventures in foreign lands, mutual interests in the little daily events at home or abroad, at sea or in port, on board ship and ashore; working, playing, rejoicing and suffering together—these are the means by which a fleet can find its own soul and become a fleet in reality. These are the means by which such a fleet spirit can be developed that the least desires and commands of its commander-in-chief are inspirations to excel and to outdo each other in accomplishing them.

The two detachments of a divided fleet may independently develop an excellent spirit, each complete and satisfactory unto itself and each inevitably with a character of its own—but they will not blend; they cannot blend. They are born of different experiences, different sympathies, different leadership, different standards of discipline, different atmospheres. In time they may partly blend and partly determine the character of a new spirit. But that is the vital point: *time*. Time is necessary—not weeks, not months—but years; not during a period of strained relations—not after a declaration of war—but in the years of peace—*now*.

Are we concentrated on the development of a fleet spirit?

VII

Training:

More or less loosely, perhaps, and incompletely, the mission of the fleet in time of peace may be stated as preparation for action in time of war. It is certain that a war with any first-class power would require the concentration of our divided fleet. Our organization is based on this fundamental assumption. We have a Pacific Fleet organization and an Atlantic Fleet organization for time of peace and, on paper, a combined organization for time of war. Once a year they meet for combined maneuvers. They failed to meet last year for lack of money with which to buy fuel. Their division was a peace time strategical weakness no less than it would have been before the existence of the canal. Had the fleet been united, tactical maneuvers undoubtedly would have been arranged for; possibly strategical maneuvers also. One year was lost in the training of the fleet *as a fleet*. Last year the cause was lack of money; what will it be next year?

The training of a great fleet to develop its maximum striking power in battle is the greatest task in organization, control, and concentrated timely effort, that man has ever set for himself. Far more than in war on land does it call for skill and resourcefulness in the commander-in-chief; far more does it call for initiative, intuition, and instant readiness on the part of subordinates to meet the ever changing situations; far less is it susceptible of detailed planning in advance. A general engagement on land may last for days, for weeks; the first five minutes of an action between fleets may decide the history of a people.

The measure of the difficulty of training this vast array of men and materials is the measure of the necessity for each cog, large and small, in the whole organization to do its part at the right time, in the right place, in the right way.

All our experience teaches us that nothing but unremitting drill and rehearsals will enable us to approximate the maximum development of the men and materials we control. It has long been held as a cardinal principle of gunnery training in the United States navy that drill conditions should simulate as closely as possible conditions apt to be met in time of battle. And yet we divide our fleet for training!

The problem of developing the maximum power of a fleet in the face of the enemy is a problem of fleet tactical control. It is a complex problem requiring control over the movements, distribution, development of the offensive power and of the special objectives of battleships, scouts, destroyers, submarines, aircraft, mine layers and possibly other special types. It is a fleet control problem, very similar in nature to the ship control and fire control of a ship, but vastly more complicated. We have learned that the complications of fire control within a single ship are such that almost daily drill is necessary to hold the organization up to the mark.

How do we hope to master the far more intricate problem of fleet control with a fleet divided some eleven months out of the year?

Not only does our general naval training and in particular our target practice training teach us the value, the absolute necessity of team work, of drilling together, of simulating actual conditions, but everything in our school life, in commercial life and in our whole modern, national existence points in the same direction. "Team work" is the foundation of all training which requires the simultaneous play of many forces. True of sports, true of industry, true of business, it is a thousand times true of the delicate, intricate, timely interplay required of the many forces which make up a fleet.

The analogy of the team work of the football team, although well worn, is just as true today as ever. Let us suppose that Yale University and the University of California should agree to develop a single football team, Yale furnishing one side of

the line and two backs and California furnishing the rest of the line and the other two backs, each division of the team having its own captain. If we suppose that their training is independent, except for two or three days a month when they meet for combined training, and that the captain of the Yale contingent is captain of the combined team on such occasions, we shall very closely reproduce the essentials of the present fleet distribution. Exchanges of correspondence and of signals, of plans of attack and defense, of ideas, will be of little value when the opening of the season comes. The captain from Yale, no matter how complete his knowledge of the tactics and strategy of football, will not be accustomed to applying them to such a large team. The straight line bucking may go fairly well but the forward passes and shifts which require the two sides of the line to work together in nice precision are apt to result in fumbles and ragged work. In fact, as a team, it wouldn't amount to much although the individual players might be excellent. A first-class high school team might beat it.

Is the division of the fleet so very different in respect to its training? Will a brief annual mobilization for combined maneuvers replace the habit of acting together as a fleet, of thinking in terms of a fleet? Can we, in one month out of each year, develop in a fleet that team work which we find requires several days a week the year round to develop in a single ship? *Are we concentrated on training?*

VIII

Other Considerations:

Now there are other considerations than leadership, loyalty, discipline, fleet spirit, and training. Are the Eastern navy yards adequate for the maintenance of the combined fleet? Are the West Coast navy yards adequate for its maintenance? What about the political opposition which would develop against moving the remainder of the active fleet to the Pacific or returning the Pacific fleet to the Atlantic? Would not such action by the Navy Department alienate some of the navy's most powerful political friends? Why become alarmed at the idea of separated detachments joining up on the eve of battle? Is not the history of naval warfare full of such instances? Does not that great master of warfare, Napoleon, say: "The art of war consists in

dissemination of force in order to subsist, with due regard to concentration in order to fight"? Is not the division of the fleet between the two seas a dissemination in order to subsist and does not the canal provide for concentration in order to fight?

To answer these questions we have only to examine them in the clear light of the principles of concentration, "the A, B, C of naval strategy," of concentration applied in the spirit, and we shall find that the naval strategy of peace is not so different from that of war. We shall find that the objections to actual concentration in time of peace are of importance, well founded and well worthy of careful consideration but we shall find also that they are not vital and that they are not insuperable. We shall find that the considerations which have led to the division of the fleet are those of expediency. We shall find that the considerations which demand an undivided fleet are vital and fundamental and that they cannot be disregarded nor material arrangements substituted for them.

Napoleon's own definition of the art of war—"Dissemination of force in order to subsist, with due regard to concentration in order to fight,"—is obviously based on the assumption that the dissemination is *necessary*. There is no virtue in the separation of forces merely for the sake of separation. The separation is a means to an end; the end is subsistence, maintenance. Separation is a necessary evil to be accepted only when the end justifies the means; when subsistence cannot be provided except by dissemination. A partial dispersion in time of war may be necessary for the purpose of masking a proposed stroke or for observing the several detachments of a divided enemy or for affording the means of making a ready concentration at one of several points over a given area. These are situations incident to war. In time of peace the mission of the fleet is preparation for war, anticipation of war. The deployment of the fleet in time of peace should be that which most readily facilitates accomplishment of the mission. If the division of the fleet in time of peace is not necessary for purposes of maintenance, upon what legitimate grounds from the viewpoint of strategy can it be defended?

Let us briefly examine the maintenance facilities of the Atlantic and Pacific coasts and attempt to determine whether a division of the fleet is necessary for purposes of maintenance.

It is pertinent to point out first that the United States fleet, built and building, at the time of the decision to divide it between the two seas comprised twenty-nine dreadnaughts and six battle cruisers or a total of thirty-five first-class ships, not including eighteen pre-dreadnaughts. Since this decision was made the premises upon which it was based have entirely changed. At the Conference on the Limitation of Armaments we gave up this great fleet and restricted ourselves to eighteen first-class ships for the next ten years. Our total fleet of first-class ships therefore is now and for ten years will be less than half the number contemplated at the time of the division of the fleet.

With regard to the adequacy of the Eastern navy yards for maintaining this fleet there can be no question and no need for argument or for laboring the point in detail. The repair and docking facilities of the navy yards of Portsmouth, N. H., Boston, New York, Philadelphia, Norfolk, and Charleston will be more than sufficient after the scrapping of the old battleships shall have been accomplished. Their effective facilities for the maintenance of the active fleet in commission could be further increased, if necessary, by transferring destroyers and other vessels in ordinary, in reserve or out of commission to the Pacific navy yards.

On the Pacific coast the situation is different. Would the material condition of the fleet in time of peace suffer through lack of facilities to maintain it under the present conditions if concentrated on the Pacific coast? One of the greatest lessons of the World War was the discovery of our own capacity for taking care of material when the opportunity for active service furnished the incentive. Ships which had been the best friends of the navy yards but strangers to the sea went across and held their own in active service for over a year without mishap. We do not need another war to be able to duplicate this; we know what we can do; we must and will continue to do it. With this recently gained knowledge and experience and the wonderful development of the repair ship in recent years we are much less dependent upon navy yards than in former years.

Repair ships and all the initiative, enthusiasm and technical knowledge in the world, however, cannot provide dry-docks. How do we stand in this respect on the Pacific coast? For war

purposes they are unquestionably inadequate. For peace purposes they are not all they should be but, in the opinion of the writer, they are sufficient to maintain the "Treaty Navy" on a peace footing if continuous docking schedules are maintained and their utmost capacity utilized.

The navy owns but one dry-dock on the west coast of the United States of sufficient capacity to dock any of the eighteen battleships. This dock is at Bremerton. At Hunter's Point in San Francisco Bay is a larger dry-dock belonging to the Bethlehem Steel Company which will take our largest battleships and the two battle cruisers which are to be converted to airplane carriers. Arrangements have been made by the Navy Department for the use of this dock. At Pearl Harbor is an immense dock which also will take all battleships and the airplane carriers. At Balboa is a fourth dry-dock larger than any of the others.

Bremerton, San Francisco, Pearl Harbor, and Balboa;—true, the distances are great; docking schedules will involve more difficulty than would be necessary with more adequate facilities, but the cruising involved, the acquaintance gained with these strategically important positions and their resources, the experience gained by the shore stations themselves in docking and repairing big ships—all these come under the head of preparation and training for war.

The two dry-docks at Mare Island and the remaining dock at Bremerton are available for cruisers, vessels of the train and all vessels smaller than battleships. In addition to these there is an enormous combination building way and shallow dry-dock at Bremerton with twenty feet of water over the sill in which several entire squadrons of destroyers or submarines could be docked at one time or large numbers of mine layers, light cruisers and other medium draught vessels.

Unquestionably the shore facilities of the Pacific coast are meager; beyond all doubt San Francisco Bay, the strategical center, should shelter a naval base of the first order, capable of docking and repairing the largest ships. But—for the maintenance of the fleet in time of peace it is not outside the bounds of conservatism to say that the development of the full capacities of the existing shore establishments of the Pacific coast together with the assignment to the fleet of all repair vessels will provide

for the maintenance of the entire active fleet in full commission without lowering its standard of material condition. This presupposes that all manufacturing and shipbuilding work now done in the western yards be assigned to those of the Atlantic coast, that all vessels out of commission, in ordinary or in reserve be maintained at eastern navy yards and that the full capacity of the west coast yards be devoted to repairs, maintenance and supply—the true functions of navy yards.

The concentration of the active fleet on either coast would undoubtedly be accompanied by a great outcry from the states of the opposite coast. This would be partly political in origin and partly due to an honest but uninstructed belief by a great many that their coast or their states would be left unprotected. The truth of the matter is that a concentrated fleet in the Pacific is a better protection for the Atlantic states than half a fleet on either coast. It is equally true that a fleet concentrated in the Atlantic is a better protection for the Pacific states than a fleet divided between the two seas. We may not be able to overcome political opposition to reuniting the fleet. We may alienate powerful political friends of the navy. We may temporarily sacrifice valuable Congressional support. But this much is certain: We cannot afford to sacrifice a vital principle for expediency. If division of the fleet vitiates the principle of strategical concentration; if continued division in time of peace weakens the strength of the fleet for battle, then we cannot afford to keep the friends who can be held only at the price of division. We must not forget that there are many states which do not lie on either coast but which are just as dependent upon the navy for protection as New York or California.

We have not created a Pacific fleet for the protection of the Pacific states and an Atlantic fleet for the protection of the Atlantic states but we have divided the one and only fleet which we own and which was built for the protection of the *United* States.

And yet the people of the nation firmly believe that by dividing the fleet we have added to the security of the country; that we are now protecting both coasts where formerly we protected but one. Are we of the navy beginning to believe this too?

We should not allow the fleet organization which assigns battleships to the battle force, the scouting force, and the control force to obscure the clear, essential fundamentals of concentration. Whatever assignment of some of our eighteen first-line ships to other forces than the battle force may be necessary for special purposes they yet remain members of the battle force in fact, and we may be sure that the commander-in-chief will look to a disposition which will permit every one of the eighteen to lie in the line when the day of battle comes.

Our present battleship distribution gives approximately two thirds to the Pacific and one third to the Atlantic. Is not the *two* thirds in the Pacific a partial concession to concentration in principle and is not the *one* third in the Atlantic a concession to other influences and a denial of concentration in fact? Is not the result a compromise rather than a strategic combination and are not military compromises usually disastrous?

Is not the "wall of steel round our ocean boundaries" in reality a weakening through attenuation? A marline-spike or a sash weight is a better weapon than an equal amount of metal drawn out into a long wire. Its force can be *concentrated*.

The division of the fleet as it now exists can be defended only upon the ground of the existence of the Panama Canal and the interior position which it gives us. It is our central position connecting our sea frontiers. We hope that it is impregnable. We were once told that Liege, Namur, and Antwerp were impregnable—and that was in the days before great bombing planes. Is not a division of the fleet on either side of and distant two thousand to three thousand miles from our connecting central position a standing invitation to an enemy to attack the Canal as the first step in an attempt to make the division permanent? Has any sure defense been developed against surprise attack by bombing planes?

Policy may require that the fleet be in the Atlantic at one time or in the Pacific at another but, insofar as the requirements of sound strategy are concerned, is it not the truth, the sum and substance of the whole matter, that it is immaterial whether the fleet be in the Atlantic or in the Pacific provided only that we keep it concentrated; a fleet in fact?

What of the period of strained relations, of days, weeks, perhaps months, which usually precedes a declaration of war? Would not the mobilization in our case be such an obvious, overt act that probably it could not be undertaken for fear that this hostile movement of the navy might precipitate the very war which, by a show of *concentrated* force, it might have prevented?

Are not the very names "Atlantic fleet" and "Pacific fleet" misleading? Can they do otherwise than lead the nation and perhaps ourselves to believe that we actually have two fleets? Have we in reality two fleets or have we two parts of one fleet?

Are not the essentials of the principle of concentration being violated today just as certainly, if not to the same extent, as they would have been by a similar division of the fleet before the building of the Canal?

"Like every sound principle, concentration must be held and applied in the spirit, not in the letter only; exercised with understanding, not merely literally."

"There is thus a concentration of mental and moral outlook, of resolution, as real as the physical concentration of disposable forces."

Are we applying the spirit of concentration? Have we, with our divided fleet, a concentration of mental and moral outlook? Have we concentration of purpose? Of effort?

Is the fleet strategically concentrated?

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EVERY OFFICER A COACH

By Walter Aamold, Physical Training and Athletics, U. S. Naval Academy

Dr. R. Tait McKenzie, in writing the history of athletics, came upon a witty little incident in Homer's *Odyssey* which with slight variations is very applicable to this article. It seems that Homer's Euryalis is a bombastic sort of fellow who having gathered five or six misfits together is drinking somewhere in a dockyard. Odysseus, just fresh from the sea, chances to be passing near by. Euryalis taunts Odysseus, whom he is unable to recognize, as a "master of sailors that are merchantmen," one with a memory for his freight and gore; in fact, he adds insult beyond endurance by declaring: "Thou seemest not a man of thy hands." Odysseus, stung by the taunts of the Phæacians, picks up a discus larger than a bunker plate and hurls it halfway to the horizon, putting Euryalis and his baker's dozen in a most apologetic and affable frame of mind. Such is the trend of this ancient story and it must be admitted in behalf of the good-natured Odysseus that after a man has spent a few weeks at sea bringing his ship to port through rather stubborn weather, he is in no mood to be looked upon as a man not of his hands; in fact, he is very apt to be feeling all hands and feet at the moment of challenge.

For some unaccountable reason there seems to be a universal belief that officers are somewhat apart from anything that pertains to physical performance. Despite history, the recent war, the 1920 Olympic Games, there are still murmurs of surprise in the grand stand when an officer is announced in the line-up of an athletic team in which mixed players are entered. At a recent Army-Marine football game played on a college campus the spectators on learning that several officers were to play halfway

expected to see them unpacked from boxes of excelsior and marked "handle with care." After the game had been on awhile the wonder was why they were not kept in iron cages! Considering that the average officer has played a good hard game of some sort while acquiring an education, why should there be such surprise if he keeps up his athletic spirit after graduation? Mainly, perhaps, because it has not been the general practice and for the reason that tradition has not directly connected military dignity with participation in athletics, at least not since the days of the Greeks.

In recent years far-seeing officers in all branches of the military establishment have pointed out that caring for the personnel during recreation hours is only second in importance to training men for duty. In the study of morale in camp and on board ship the thought is that men must have a healthy outlet for their energies to offset their getting into mischief when left entirely on their own resources. With this idea in mind there has been developed a very complete organization to promote athletics and recreational interests of a healthy nature. Naturally the full burden of execution became part of the complex duty of the officers in direct control of personnel, which of course immediately brought about an ever-increasing demand for officers skilled as directors and coaches. From this new system it is very doubtful whether the average officer realizes to what extent athletic coaching has been developed in the service, and it is safe to say that he does not fully credit himself with his own latent ability as a coach. Not so long ago a memorandum was sent around to a group of officers with the request that those interested come forward and assist in coaching, or at least receive instructions in that direction. In most cases the answers indicated that the officers were more than willing to help along but stated that they had had no experience as players in the particular sport in question, or that their experience had been gained some years before and they feared that by now the conditions were greatly changed. In this respect it is to be remembered:

Some of America's leading coaches never as much as played one game in the sport they now handle with such marked success. Actual participation as a player is not a requirement for a coach.

Others stated that they knew little if anything about coaching,

yet perhaps they had drilled many a gun's crew—which performance has in it all the factors to be found in coaching an athletic team.

Coaching in its broadest aspects is a distinct form of spirited leadership governed by the leader's force of character. It has no discipline behind it except that established by respect, a willingness to follow, and the leader's ability to handle men to their best advantage. Does not the President coach his cabinet, or a captain of industry his directors? Indeed so! Coaching finds its way into all organizations founded on leadership and its fundamental principles most surely are not confined entirely to athletics. In nearly every case it is simply a question of a good leader taking off his cloak of authority and going in on his mettle, his energy, and his sense of fair play. It resembles nothing so much as common sense. If he's that kind of a man; if he can lead by sheer ability unassisted by outside discipline, then—he's a premier coach and his opponents will be up nights trying to fathom his methods of success.

Changing from military leadership to athletic coaching is much less abrupt than leaving duties on shipboard to direct a landing party. It is mostly a question of adaptability, and variety of service is but Hobson's choice in the service.

An officer capable of exercising command is, subject to a study of coaching problems, particularly qualified to serve as a successful coach.

The first problem facing a coach is the selection of material. In this the officer must have handy the same yard-stick that he has been using in making up the crew of a turret. The same group of nickle-steel men will be found, likewise the mediocre candidates out for a good time, as well as the tail-enders who just happen to be there, and a few "twilight sleepers" from which some unknown may be developed into a first-line man. Navy's famous old crew coach, "Dick" Glendon, has stated it something like this: The season opens with a plentiful supply of crucible material; then the boiling down begins and soon a decided division takes place—finally one day there is pure gold and slag. Upon the gold hammers the coach, moulding it into a dependable unit of known quantity and value. *It is the first aim, then, to get at the gold and mould it to one's liking!*

It may seem strange at first glance that the unit of modern-day athletic groups is not the team. The new unit is the squad—a homogeneous force composed of the first team with at least one runner-up for every position. The unit thus becomes the team with a strong reserve that can hit under all conditions and not be weakened by substitutions! It is a weapon sharpened to a deadly edge by competition within itself.

The tactical control of the team when in action is through an indoctrinated field general, the coach being barred by the rules. In every squad there should be at least three well-trained field generals, each equally capable of taking instant command. If there is such a thing as mental telepathy it should most certainly exist between the coach who sits on the side-lines and his field general directing the fray. If there is super-skill in the coach it should not be lost on the bench, but should be reflected in a modest measure on the field of play. A well-executed play is not a spasmodic outcropping in the midst of the game, it is but the natural result of patient training. The breaks go to the team having the greatest strength—the alibi is gratis to the defeated.

The next important feature in coaching is suppression. First of all resist the temptation to build a team around a star. It is a one-man affair, and at the best a star is but a flash against clever opponents. A recognized star promotes individual and temperamental play as contrasted with teamwork. To allow a would-be star the slightest advantage over others of the squad is to detract from all—work the squad as a unit favoring none. Perhaps if it is not one star troubling a coach it is a clique of some sort. Since there must be absolute unity of control—unity of action and unity of thought, when a coterie first shows itself—off with its head!

In brief, the spirit to be instilled in the squad is well expressed by Dr. McKenzie in his description of the Greek word *Aidos*: ". . . . for which the exact English equivalent is hard to find, but which is opposed to both insolence and servility, that, while it puts into a man's heart the thrill and joy of the fight, restrains him from using his strength like a brute or from cringing to a superior force; that wins for him honor and respect, in victory or defeat, instead of terror from the weak and contempt from the strong. It includes that scrupulous respect for personal honor and fair-

ness that would make a team elect to risk a probable defeat rather than win through the services of those who do not come within the spirit of a gentleman's agreement. It is that spirit of modesty and dignity that obeys the law, even if the decision seems unjust, instead of piercing the air with protestations."

Turning to policy of play the officer is still very much at home as a coach, for in all forms of competition the leading factors are offense and defense. For reasons unknown to man where offense and defense would seem equal the offense actually succeeds—perhaps on account of its accumulative features; sufficient to say a strong offense will be the ruling passion of a coach marked for the path of victory. In the offense there are elements of defense; in the defense there is little more than a time interval looking forward to an opportunity to take up or resume the offensive. However, the strategy of play must be well balanced, offering equal opportunities on either offense or defense. As to plan, there must be absolute simplicity. The details must be capable of being thoroughly understood and mastered by the unit as a whole and by each individual of the playing unit. Very often one sees plays fairly well executed by a team but not thoroughly understood by individuals making the play. In such cases the individual depends upon guidance from other players, and if there is a disruption of any sort, the play is quickly broken up. The greater the tactics, the simpler the execution. Complexity and confusion are old shipmates of failure. In every move of every play each man should have a part at full strength either for concentrated action or to decoy or divide opponent's force by strategy.

Contrary to popular belief coaches do not manufacture "shoestring" plays over night that are sure to win a game the following day, nor do they work out revolutionary plays with soda crackers while dining out. Their first worry is to find a solid, ground-gaining play with certain elements of stability, safety, form, and system. Such a play is very much on the order of T. N. T.—there may be explosives a great deal stronger, but because they either go too quickly or don't go at all, they are not depended upon to do the bulk of the work. This first fundamental play, then, is adopted, mastered, and finally worked into variations such as to the right or left or reversed. Following this a lighter

play is taken up as a threat, for there should always be a threat or two in a coach's bag of tricks; a feint in boxing, a bunt in baseball, and so on. As there is a time limit to training and preparation for an amateur sport, not many plays can be developed throughout a season. Few are needed—if there is a dash of genius!

To prevent any possibility of confusion and to allow for a logical development and modification of play it is essential that a coach reduce his strategy to writing and diagram before the opening of the season. This will give opportunity to discover errors and will allow a quicker development early in the season.

Conditioning a team to its highest point of power is as delicate an operation as tempering steel. A month of advance training is required during which time the vitality of the squad must never be carried below normal by over-practice. Unfortunately, this is too often the case. Training is the process of building up and conserving energy, the peak to be reached on the actual day of play, not the day before and then carried at par. The most disturbing factor in conditioning is change of diet and living conditions. Training does not mean a complete reversal of living conditions—not in the least, it is but the modification and regulation of living conditions of which the contestants are in rhythm. One would not train a Japanese runner on heavy meat—nor an American on rice. In life there is a certain well-defined rhythm similar in purpose to the balance wheel of a watch. It is there because it is the most efficient way Nature has of doing things. It swings so much this way, so much that way, always with a measured cadence that regulates the body and keeps it in tone. When training introduces new factors in the method of living the rhythm is disturbed and a new habit must be formed—a new balance established. Quite recently a coach sent his team overland for competition. On the way they came upon new fruit just coming into season. "Nothing like it for putting the boys in shape!" he declared. And it did—but the timing was wrong and the playing was therefore weak. Careful regulation results from even habit—and food above all must not be changed during a training period.

At one time throughout the service, with the exception of the Naval Academy, a large part of the coaching was done by ship's

cooks. This came about from several causes; first, the cooks were able to run an improvised training table out of hours for their particular protégé. In addition they had flexible watches and there was little athletic organization in their place. Under the régime of the old galley the original "ham-and-eggers" thrived in unholy numbers, but somehow, somewhere, the system was wrong, for none of their dandies seemed able to escape knock-outs in the ring or deck courts at the mast. Usually the candidates were blessed with ambidextrous stomachs but one-armed punches. They took up training for "kind treatment" and eating raw meat for temperament. A prolonged period of indigestion usually preceded a meet and a financial crash followed hard upon its heels, to say nothing of commissary complaints from the proletariat of the mess. Thus, by the abuses of training, the Navy soon got enough of this and a reaction set in, in the direction of welfare secretaries. Needless to say, athletics, particularly at training stations, took on a much more refined air—but still the punch was lacking! The trouble takes us back again to the selection of material. Under the new order of things the "ham-and-egger" was set aside, or rather dropped out, while the milder fellow who pulled a "strong oar in church" took up in his place. Between both extremes stood the solid material that makes up every ship's division. It was not until the division officer himself came out for coaching that the entire watch felt the appeal—it became reorganized as a ship's affair for the ship's honor with the result that "raw meat" and "postum" went by the board or around to all hands. Thus by placing coaching in the proper quarter the food question, selection, participation, and a host of other things became regulated to the present-day practice of "athletics for everybody" and the sweepers take the hindmost.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

"THE JOB"

By Lieutenant Commander J. Ogden Hoffman, U. S. Navy

To solve the problem facing the navy of today calls for every effort, every suggestion that may be offered by all branches of the service—to call into consultation, as it were, diagnosticians in the diverse fields of naval activity. Before performing the "operation" the patient must be placed under observation, even under a microscope or an X-Ray and we wish our treatment to be in every way successful and not to conclude with the statement that it succeeded "except that the patient died."

The navy recruiting service forming, as it does, the bridge between the navy and civil life, is given a peculiar insight regarding many factors that escape the notice of the service afloat. Everyone comes to recruiting duty with a considerable amount of seagoing experience and he invariably arrives at the conclusion that his knowledge of the navy was not as complete as he imagined. He is placed face-to-face with something entirely new nearly every day in the week, and eventually realizes that the training he is undergoing is a most valuable and vital part of his naval education. He will go to sea richer in experience and with a better understanding of his part in the play and of the tremendous power he controls as a factor for good or evil.

Axioms, platitudes, and even written orders will not bear fruit unless the doctrines that they teach are personally applied and sink, away down deep, into the conscientiousness of the individual. Everyone evolves some sort of a creed by which he governs his conduct, but to put this creed into words is a difficult matter, and it is still more difficult to practise it. Let us, at the outset, and until we find something better, place before us two of the ideas of the greatest exponent of the genus "Tommy," which is closely allied to the species "Gob":

"If you can fill the unforgiving minute with sixty seconds' worth of distance run". . . .

"Will paint the thing as he sees it, for the God of the things as they are."

The first quotation may be well applied to the whole service, and the purpose of this article is to "paint the thing as he sees it," from the point of view of a navy recruiter.

Every seagoing officer views, instinctively, with distaste the recruit as he comes over the side. Even as the finished product of a training station he is exceedingly new at the game and we heave a sigh and expect a lot of sympathy if we get a squad or two of him in our division. We classify him as a "recruit," a "boot," and a lot of other titles, with the mental note that we are going to have a fine Roman holiday before he becomes a regular man-o'-war's-man. The feeling of grief starts with the officer-of-the-deck as he checks him over the side, is passed along from the divisional officer to the boatswain's mate, and extends down to the last seaman, who has progressed even so far as the stage where he knows that the most important thing in a lifeboat is the plug.

If the recruit is one of the "Black Gang," he seems to fare better than his peer on deck, possibly due to the fact that he is out of sight more of the time and rarely comes under the observation of the officer-of-the-deck except when he comes up to steal a breath of air, in his steaming clothes. He has his troubles, as well, but they are more easily solved by working in the restricted areas that breed fellowship.

Having decided that the recruit is a thorough nuisance let us look at the other side of the picture and decide just how much effort should be given toward turning him into a finished naval product, a credit to the service and himself and proud of his place in the scheme of things.

Contrary to the opinion prevailing in many circles, recruits do not grow on trees nor do they come to a recruiting station begging to be enlisted. With a few exceptions, each one represents days, weeks or even months of concentrated effort on the part of a recruiting salesman who draws, usually, the pay of a chief petty officer plus a subsistence allowance, for the express purpose of completing the sale. The exact cost of each recruit, prior to

the administration of the oath of allegiance, is not known, but it is believed to be in the neighborhood of one hundred dollars, figuring pay, allowances, overhead expenses, and transportation. He represents, therefore, in addition to the time and effort of a selected petty officer, the approximate value of a one hundred dollar bill taken from the treasury.

The recruiting service has done its utmost when it delivers the recruit to the training station or receiving ship, as the case may be, and it is believed perfectly fair to state that it has accomplished more than fifty per cent of the transition from civilian to sailor. To train a man, with all the tools at hand, is infinitely more simple than to pursuade that man to discard a suit of civilian clothes for one of navy-blue. The only ones really qualified to express an opinion on the relative size of the obstacles in the paths of these two tasks are those who have wrestled with both of them. The consensus of opinion would undoubtedly be that to train him is mere child's play compared with enlisting him.

All of this has very little to do with the matter in hand, except to be retained as a background. Every recruit should be considered in the nature of a psychological puzzle, and should not be cast into the discard after the first or even the fifteenth baffled attempt at solution. To discharge a man for inaptitude, as undesirable, or even with bad conduct is the work of only a few moments. To replace him is a different story and, to understand the comparison, let us stand on the sidelines for just a few moments and look at the enlistment of an average recruit, under average conditions, and when the opportunities of civil employment are about equal with those of enlistment in the navy.

The chief petty officer in charge of the recruiting sub-station at Saskatchewan hears, from a friend of his, that young Mike Jones was seen looking at a navy poster in Mulligan's pool parlor last Thursday night. The CPO immediately writes "Mike Jones-Mulligan's pool parlor" in the little book that is his inseparable companion, and starts on the trail with the combined finesse and nature of approach of a Sherlock Holmes or a Disraeli. He finally meets M. Jones, who is interested in the navy not at all, and, finding out where he lives, sends notice of the same to the main station for the mailing list, causing the said M. Jones to receive a flock of letters, carefully multigraphed and most of

them actually signed. In the meantime, our CPO runs against the stone wall of the Jones family who have raised their boy to be an enterprising road-mender. They cannot see the navy as a career through a pair of field-glasses, and Mrs. Jones, especially, impresses upon the CPO the importance of having her Mike at home every night, of getting the greater part of his pay envelope of fifteen dollars a week, and of having him around the house to do odd jobs, even though she admits that Mike, at fifty, will probably be what he is now, a road-mender or common laborer.

The CPO must now "sell" the navy to all the Jones family, individually and collectively, and he never gives up until Mike is on his way to the main station with an application and birth certificate, consent papers, or whatever else is required. To complete the sale has taken hard, unremitting work, and considerable initiative. As an investment, it should never be discounted in connection with the future treatment that the recruit receives.

There are, of course, cases where the enlistment is accomplished with very little expenditure of time or trouble, but the above case, appearing, perhaps, humorous and overdrawn, is as true to life as can be painted in a few words. Just as there are easy "sales" of the navy, so are there cases of newly enlisted men who respond to discipline like veterans. Both of these are the exception, however, and every case, easy or hard, should demand detailed examination and weighing on its merits. The recruiter never stops until he has accomplished the desired object, and, in all justice, his peer at sea should, at least, give the matter a proportionate amount of thought, and never give up until the case is proved to be absolutely hopeless. As a matter of pure business economy and conservation of material and energy for the service as a whole, coordinated effort should be obligatory, not merely optional.

Before passing to the discussion of actual methods for solution of the great problem that faces the navy, let us remember that the officer and man on recruiting duty have a much better opportunity for observing the workings of the navy afloat, in its relation to the American home, than have the responsible officer and petty officer on board ship. A recruiting station comes as near to the position of umpire, in but not part of the navy, as is possible for people wearing the same uniform. It looks at ships, at life on board those ships and at training stations as at a play

viewed from an orchestra seat. All the little details of daily life, the "sets and acts" are under the pitiless glare of the footlights of public criticism, brought home to the recruiting station everyday in the week by the relatives and friends of men in the service and; often, by the men themselves. A man will often tell a recruiting officer many things that he will not disclose to an officer on his ship, even the chaplain, and the man's mother will not hesitate to express her opinion in language that is often exceedingly plain and free from verbal camouflage.

It is not desired to give the impression that what is said is always in the nature of adverse criticism, because it is quite often the reverse. In every story, however, there is a modicum of truth, and it is the recruiting officer's business, far the greater part of his business, to analyze these personal situations. To the casual observer, his mission is, solely, to keep pace with the needs of the naval establishment, to display a blue banner, and recruit men in whatever quantity they are required. As a matter of fact, the business of enlistments takes only a small part of his time, the remainder being devoted to explaining the ramifications of the navy to the layman in need of professional advice and assistance. It is the recruiter's business and duty to answer all questions pertaining to naval procedure, much of which is, to the average civilian, like so much free Greek.

The recruiting service does not, as is often thought, deal in parables in making one of its "sales." Every recruiting agent, in conducting his operations is, in so many words, asking the candidate to cast off his civilian raiment and, after donning the uniform, to strive after a number of years to reach the plane of culture, training and prestige enjoyed by the recruiter. To the honor of the service, be it said that the men on this duty represent the highest type the navy has to offer, and when they follow this line of attack with their potential recruits, it is no empty boast. They mean what they say, they believe in the service that has made them what they are, and these thoughts and convictions cause them to hold their heads higher, throw back their shoulders and look the world straight in the eye. Their methods usually succeed unless, inadvertently, the applicant is subjected to adverse influences before he has finally made up his mind. It has happened on several occasions that an applicant, on his way home,

shall we say, to obtain his father's consent, encounters a man on leave of absence from a ship or training station, and asks him whether or not the information and outline of prospects received from the recruiting agent are correct. Many an enlistment has been nipped in the bud by just such a conversation, rendering valueless days or weeks of effort. The man who is considering the navy as a career will, nearly every time, place more faith in what he hears from a youngster like himself than on what is told him from a man of long service. It is pretty rough on the recruiter to be told by his erstwhile candidate that a blue jacket said to him: "I have only a year and a butt to do and, believe me, when that is through, so am I." All the argument in the world will not overthrow the impression that has been made on that young man's mind, and to say that it is "unfair" is putting it mildly. It is not only unfair but unnecessary, as well, and represents a state of mind that can and should be altered if the service is to get on its feet and stay there.

There is only one way to do it and that is to *pitch in and do it,* just as *"Go get 'em"* has been made the watchword of the recruiting service, without any excuses or alibis. The process must start from the very moment the recruit puts on his first suit of uniform and must be continued until a board of officers has definitely and finally decided that he is absolutely hopeless. The navy as a pictorial has been sold to him, or he would not be in uniform. The *real* navy must now be sold to him, every step of the way, with gradually increased complexity, just as though he were being mentally rather than psychically educated. Through him, the navy must be sold to his family, as a bitter and heartbroken letter from a home, hundreds of miles away, will more than counter-balance months of training. The man on board ship or at station who receives no mail is very much the exception. For nearly every one of them there is some influence, some tie that connects him with the hearth or home, and this tie *must* be made a help and a goad rather than a definite hindrance.

It is quite true that the primary object of any navy is preparedness for battle, but it is simply useless to strive for a record at target practice, speed trials, athletics or anything else, before a team has been developed. There is only one way to develop a team, and that is for the members of it to get their heads together

and to be actuated by some common purpose. The story of how the navy was built up in the last few months of the recruiting drive following the great war is a good example of what can be accomplished by concerted effort and the example is well worthy of emulation.

As the "Team-Unit" we will take the division on board ship and the divisional officer as the captain of that team. We can go up and down the scale in organization and apply the same basic principles to each rung in the ladder, each link in the chain, but the division will serve as an example. The captain of this team must learn to know the men under him as he knows the letters that spell his own name. They must come before his personal enjoyment, his leisure, his own inclinations and before everything else except his loyalty.

He must study their problems and help in their solution with the full benefit of the experience that has been given him by his rank and the superior opportunity of education. Until he rises from the status of divisional officer to head of department, the men, the flesh and blood, of his division must be constantly in his thoughts.

It is very easy to consider a large body of men from an impersonal point of view, and hard to remember that every man is an individual, a human problem, with his likes, dislikes, personal troubles and responsibilites. It is the divisional officer's great privilege, if he only will, to hold a body of American fighting men in the hollow of his hand, and, just as he must know every one of his men, so must the knowledge be mutual. To the officer belongs the initial breaking of the shell of mutual unconcern which often leads to distrust and, although the original advance may be repulsed, tact and a plain understanding of human nature will invariably succeed in the long run. The divisional officer must always be in the minds of his men, not as a figure-head, not as the man "higher up" whom they must evade if they wish to escape punishment, but as the power who will fight for them or fight with them as the case demands, and who is, invariably, generous and just.

To illustrate the exact opposite of what should be accomplished, there may be cited the case of an enlisted man, approaching the recruiting officer, as many of them do, for transportation back to

his ship. In spite of the fact that he had been on that ship for several months, he did not know the name of his divisional officer —*did not even know his name!* Could this man be blamed for a breach of discipline and would the plea of ignorance carry any weight with a summary court-martial?

The problem facing the navy today differs from any problem that has faced it prior to the Great War. Before the day of great expansion, when the navy grew, almost over night, like an inflated balloon, on every ship there was a large percentage of men with several years' service, at least, who could indoctrinate the recruit with the ways of the service, whether or not the divisional officer felt so inclined. Then came the war, then collapse of the balloon, to be followed by a repetition of the rapid growth and a renewal of the cycle.

We are certainly under some obligation to these thousands of new men who enlisted in perfectly good faith and whose apparent failure is due to ninety per cent ignorance to ten per cent inaptitude and undesirability. The status and duties of a divisional officer are unchanged but he must enter into those duties with his whole soul and not half-heartedly nor as an unpleasant phase of modern development. What was necessary and advisable to a lesser degree is now absolutely mandatory.

If the proper spirit exists at the head of the division it will be reflected throughout and the boatswain's mates and subordinate petty officers can be made of invaluable assistance, but minor in responsibility to their chief. The organization of the squad system is a fine thing just so long as the squad leader realizes that the issue of orders is only a small part of his duties toward that squad, but neither he nor the divisional officer will have carried out the spirit of the code until they get to really know, individually, the man inside the uniform. The spirit of the regulations stands a great deal higher up the scale than the letter of them, just as the man who can deduce a formula will outdistance the one who abides by thumb rules.

At the very foundation of our structure lies discipline and until the recruit knows and understands it for what it is, nothing further can be done with him, in the navy, at least. To the average man in civil life, discipline consists, entirely, of severe regulations that make the wearing of the uniform a burden, a

system from which the civilian is fortunately exempt. It embodies a lot of bugbears like saluting, having to keep in certain places, wearing clothes a certain way, being allowed to do this and forbidden to do that, not for any particular reason but just because the Blue Book "says so." This is the frame of mind of the average man enlisting for the first time, and he leaves the recruiting station with the idea, in spite of what has been told him by the recruiting petty officer, that he will have a good time in the navy and make a success of it, only if he succeeds in dodging around, in and out and among the rules and regulations.

His naval education will not start until he knows, really *knows*, that "discipline comprises a code designed so that a number of men may live together and, if necessary, die together, in a confined space, and *without getting in each other's way.*" This definition is not original but it is believed to explain the matter in the fewest possible words and, when it is understood, will shed new light on the subject, not only to recruits but to everyone in the service. For example, the man who is an hour over liberty and is punished for it, will realize that he is punished not for the fact of one hour more or less, but because he is a mess-cook, and his delay in returning to the ship has made twenty men wait for their breakfast. No matter what his duties, he has his own particular place to fill, and his bit to do and the doctrine of "live and let live" is the basis of all discipline.

Men cannot be taught these things by orders posted on the bulletin board or even published at general muster. They must have it explained to them, personally, by someone, just as ten minutes of good sales-talk is worth several hundred posters, in advertising value. In the first place, official correspondence and written orders are in the nature of third or fourth grade studies. We cannot give them to students in the primary school and expect them to be understood as they would be by graduates of the War College. The best disciplinarian is always the one who assigns the least punishments. Why? Because his men know what they have to do and what is expected of them, without being punished.

The royal road to learning is laid, as a preliminary, in the old "A to Z" of General Order Number 63—the "things that every man on the ship should know." Incidentally, he should know

them before he presents himself for examination for advancement in rating when, as a matter of fact, the majority of men hear of them for the first time. He should know these things and a lot more, so that his initial promotion requires no additional study. Every letter of the alphabet must be "sold" to him, one at a time—not merely "told" to him. There is a vast difference and many a slip between those two words, as any salesman knows, as every recruiting agent has learned by hard sledding and poor results when he starts on this duty with the idea that there is "nothing to it."

Having done our best to teach him the rudiments of discipline and the things that every sailor should know, we, the officers and experienced enlisted men of the navy may hope to see improvement in the raw material in our charge, and not before then. It must be impressed upon every man that the navy is similar to any other concern employing large numbers of men in that the individual gets out of it exactly what he puts in, no more no less. It will pay him dividends only if he makes the initial deposits and, whether or not he will be called upon to sell it to anyone else, he must start by selling it to himself, assisted and directed by his superiors. After selling it to himself, he must sell it to his family, and, for this reason, the "family" of every man in the division forms a vital link in the chain between the divisional officer and the man, and between the navy and the American people. To the majority of officers, the enlisted man's family exists only in the abstract, sometimes not even in that state. They believe that the family affairs of the crew devolve upon the chaplain, only, for assistance and that they are none of their business. In this, they are believed to be absolutely wrong, as evidenced by numerous cases where efficiency has been evolved from inefficiency, through the co-operation and assistance of those at home.

The causes of dissatisfaction, as witnessed by the recruiting service, and brought home by an infinity of concrete examples, may be divided among the following general headings:

(a) Absence over liberty.

(b) Allotments.

(c) Uncertainty.

(a) *Absence over liberty:*

The above, which is the fore-runner of desertion, brings more enlisted visitors to the recruiting station than does any other single motive. Every man, presenting himself and requesting transportation back to his ship is carefully questioned in an effort to diagnose his case and determine the underlying causes. In nine cases out of ten, the trouble is financial—the man has not sufficient funds to return and, in the majority of cases, he did not have the necessary funds when he left his ship. On the leave papers issued by many ships and stations, and presented by men as evidence of their status, there has appeared a printed notice to the effect that the bearer must provide himself with the necessary return transportation and that he is forbidden to apply at a recruiting station for the same. In nearly all cases where men have such a paper in their possession, they have not read the above statement and did not know that it was so noted. When given their permission to go on furlough, they simply put it in their pocket and headed for the nearest railroad station, without reading what was said on it. The college graduate, or the commissioned officer of fifteen years service would have read his orders from top to bottom, undoubtedly, but not the man who is new to the navy, or even the man who has been in the navy several years. It does not require a very deep student of psychology to tell whether or not a man is telling the truth, and the facts stand, that the majority of men going on leave are far from fully aware of their obligations. It is easy enough to say that they should know, or that the order was read out at "Quarters" or that it was posted on the bulletin board, but the fact remains that they did NOT know about it, all of which is merely a very poor alibi for the responsible officer. The divisional officer or the squad leader, either one, should have seen, with his own eyes, that the man had an order for return transportation in his possession, before he left the ship. If this were carried out, it is believed that absence over liberty would be relegated to the past, except in a few isolated cases, where the excuses were perfectly legimate.

To say that absence over liberty invariably leads to desertion would be a gross exaggeration, but the statement that over ninety per cent of deserters descend to that status as the result of absence over liberty comes very near the truth. A man goes home, or

elsewhere, on leave, spends the money that he brought with him, cannot find or is afraid to go to a Recruiting Station, and we have all the elements of a case of desertion. He may have had every intention of going back to his ship on time, but days of absence over leave pile up very easily and, the first thing he knows, a reward of fifty dollars is being offered for his return.

Occasionally, men deliberately desert, but such cases are very few and far between. We may say that all men in the navy should know that they are supposed to get back on time, that they will be declared as deserters if they absent themselves ten days and that we cannot be expected to nurse them like a lot of school children. All of this is very true, but the fact remains that there are thousands of deserters at large and that, to stamp out the evil, we must remove the cause. It is simply a matter of indoctrination and must be driven home by every officer and petty officer who has men in his charge. The apprehension of deserters is fraught with so many difficulties that the greater part of them flaunt their desertion openly, bring an enormous amount of discredit upon the naval service and uniform and can do more harm in a few minutes than can be counteracted by several months of recruiting activity and salesmanship.

(b) *Allotments:*

Nearly every man in the navy has, prior to his entry into the service, contributed to a greater or less extent to the support of a family. The majority of recruits, before enlisting, faithfully promise their father, mother, or sister, as the case may be, to make an allotment in his or her favor. Many of them promptly forget this promise with their first suit of uniform and the navy, and not the man, himself, is usually held to blame for the state of affairs that ensues. The parent or relative involved goes to the nearest recruiting station for advice and assistance and, in many cases, writes to the Bureau of Navigation requesting that the man be discharged. If this is not done, the man receives a number of depressing letters from home that, at the very least, cannot help but impair his efficiency. He may like the service, be doing splendidly, and yet will be driven to requesting his discharge, in order to return to his home. He will give up the substance to pursue the shadow of possible employment in civil life, the navy

loses on him, absolutely, as an investment and, in many cases, he is no better off when he does get home to find the promised job given to someone else, or the concern for which he has been working closed down indefinitely. If this man had made an immediate allotment, the regular contribution received by his family would have satisfied them and the man would render value received in return for the expenditure of time and money in his training.

The recruiting service has the opportunity of following such cases from start to finish as the Bureau of Navigation directs an investigation following every request for discharge. Many men, particularly when they are young, enlist without obtaining the consent or even condonement of their parents, and the navy will never be popular with its owners, the American people, until the families of its personnel help and not hinder them. To make the navy "popular" means that every man in the navy should be an object of envy to his civilian brother, and not a subject for ridicule or amusement. Thousands of cases appear where the navy, in the abstract, is approved by a mother or father, but neither of them think of the navy in the concrete with anything but distaste. They are sorry that their son enlisted instead of being proud and happy that he is being given such a wonderful chance for improvement and self-betterment. If they have this impression when they are not, in any way, dependent upon their son for support, what must it be when his enlistment means greatly increased hardship?

The family, as an obligation, must come within the horizon of the divisional officer. The matter of allotments concerns many people beside the supply officer and the man concerned, and should be on record for every man, in every division book on board ship. The divisional officer should make it his business to be acquainted with the family affairs of every man in his division and to know just what relation the man bears to his family, as a wage-earner and a contributor to its support.

(c) *Uncertainty:*

A large part of the preliminary indoctrination of a recruit should be concerned with basic facts about the navy and about himself as a member of its personnel. He should know "where he stands" in all matters that concern him, and there should be

built up a systematic and lasting foundation for his future. The time is here when men should consider, carefully, the benefits that they used to receive thoughtlessly, and weigh them against comparative benefits that they would receive anywhere else, in any other profession. It is all part of the game of salesmanship, and they cannot hope for advancement, or to be in the least qualified for it until they know all about the concern for which they are working.

A little knowledge is more dangerous than almost anything in the world and it is the distinct responsibility and privilege of the divisional officer to substitute facts for fancy with every man in his division.

The following suggestions are offered:

(1) A card index for every division in which will be found complete information about every man, including a transcript of his current enlistment record, the members, ages and residence of his family and a rough log of his progress.

(2) Two (2) hours, five (5) days a week for divisional instruction. Half of the period to be spent by squad leaders with their squads, and the other half by the divisional officers with their respective divisions.

(3) All divisional officers to be in their rooms one (1) hour a day, at a specified time, to answer personal questions, investigate special cases or to confer with petty officers, as they may elect.

(4) A Board on every ship, composed for the purpose of investigating the cases of all men reported as undesirable or inapt. No man to be recommended for discharge of this character except by sentence of the Board which will have brought before it certified statements by officers and petty officers concerned, testifying to concrete examples of undesirability or inaptitude.

THE JOB

The job before the navy does not concern a few individuals elected for its solution, but is the personal business of every officer and man in uniform.

The "job" will have been completed when any sailor can meet any civilian on his own grounds and demonstrate to him and prove that the navy is the best investment in the world. His answer will not be "I have only a year and a butt to do and, believe me, when that is through, so am I." He will say, "There is nothing like it, the sooner you sign up the better and I can *prove* it."

THE TRIPOLI MONUMENT AS IT STANDS TODAY IN THE NAVAL ACADEMY GROUNDS AT ANNAPOLIS, MD.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TRIPOLI MONUMENT

By Captain C. Q. Wright, Ch-C, U. S. Navy, Retired

Recent events along the North African shores may serve to recall our own little war in those parts, and to arouse renewed interest in the unique monument erected by our naval officers as a labor of love and token of loyalty to brave shipmates lost in that brilliant struggle.

Naming the Monument

Until removed to Annapolis, it was known as the "Navy or Naval Monument," as was also the Peace Monument in Washington, for many years—the latter also having been erected by navy people, as a naval and marine memorial. Both originated by the Porters—father and son—Commodore David Porter fathered the movement to erect the Tripoli Monument, and Admiral David Dixon Porter carried through the project of building the Peace Monument, as to which it may be of interest to state, in passing, that, as Congress gave the money for some of its statuary as well as the site for its erection, they also assumed to name it or, rather, to restore its name, and, so, instead of Navy Monument, called it officially, the Monument of Peace. However, it is generally known today as the "Peace Monument." Although it is one of the most beautiful and prominent in that much monumented city, a recent description of it by an antiquarian Congressman, in a learned lecture on the monuments there, says of the date of its dedication, "unknown." For a number of years after its erection this fine monument was called the "Navy Monument." Then there was still another "Navy Monument"—a book, published after the war of 1812, by Abel Bowser, commemorating our sea victories in that conflict.

THE VICISSITUDES OF THE TRIPOLI MONUMENT

The wanderings of the Tripoli memorial have been remarkable: conceived in the poignant tragedy of a barbarous war; born in a foreign land and under the shadow of an invader's sword; transported in the hold of *Old Ironsides* to the United States; first landed at Newport, R. I., and, as if unwelcome there, transshipped to Washington, D. C., where was shown further evidence of indifference or unfriendliness in the refusal of Congress to admit it free of duty; and held in some confusion till another service collection was made to defray the expenses of duty and erection; and, at last, landed, and raised in the navy yard at Washington; facing fire and violence six years afterwards, during the War of 1812; after a quarter of a century, removed to the Capitol grounds; and finally, removed to its present imposing and appropriate site in the beautiful grounds of the United States Naval Academy.

HISTORY

"This monument owes its existence not to public gratitude in our national government, nor to patriotic feelings of the citizens at large; but to the private friendship and admiration of the officers of the navy, who, of their own accord, assigned a portion of their pay to the erection of a memorial of actions as heroic as any that were ever achieved in naval warfare; from which, although they shared in the glory, their country alone derived the benefit."

Largely by the influence of Captain David Porter, a subscription was started in the Mediterranean Fleet, towards the end of the Tripolitan War, and when some three thousand dollars had been raised, he was authorized to contract for a suitable monument to be erected to the memory of the six officers who had been the heroic victims of that war.

Accordingly, Porter took advantage of a visit of the ships to the Italian coast, and, after advising with the most competent friends at hand, contracted with Micali of Leghorn for the design and execution of the memorial for the sum of about $3,000. The work was carried forward with so much expedition and skill that, when it was learned that the *Constitution* was about to sail for the United States and permission was given for its transportation, it was found practicable to crate and ship the monument

by that distinguished vessel in 1808, to its destined site, though it had to be landed first at Newport, R. I., and trans-shipped thence by another vessel to Washington, D. C., where it was landed unceremoniously in the navy yard after Congress refused to admit it free of duty.* It would appear that the bill to admit the monument free of duty was finally defeated by a "rider" in the Senate adding a thousand dollars for a railing and roof.

A bill to remit the duties on the Tripoli Monument was introduced in Congress about February 24, 1808, and taken up for consideration on the twenty-fifth—the following day—and ordered to the third reading.

And on March 8:

"The bill for remitting the duties payable on the importation of a monument, etc., was returned from the Senate with an amendment appropriating $1,000.00 for railing and covering the same; which was negatived in the House by yeas and nays, 59 to 48."

Latrobe, to whom was entrusted the erection of the monument, says:

"On its arrival, it became a question where it should be erected. The Capitol of the United States was pointed out as the proper place. But the unfinished state of that building and the size of the monument were objections. However, Congress was applied to, in the first place, for the sum of a thousand dollars, to defray the expense of putting it up. The application, though renewed in various shapes, proved altogether vain. The idea of placing it in the Capitol of course was given up, and the navy yard, originally the most proper situation, was chosen. To defray the expense of its erection, which could not be much less than eight hundred dollars, a further subscription by officers of the navy was also made, to which other citizens contributed." It is known that a balance left of the sum raised for relief of the victims of the unfortunate *Chesapeake* affair of the previous year was turned in to this erection fund; and that some of the contributions of officers were "taken off the books." "The Navy Department also gave every aid and facility to the work which could legally be afforded, and, in the year 1808 the monument was placed where it now

**National Intelligencer* of Monday, February 8, 1808, page 3, stated that: "The monument to be erected to the memory of officers who fell in the Mediterranean has arrived; and is now at the navy yard."

stands; the principal object of view to all those who enter the yard, either by land or water, and to an extensive portion of the city and of the port."

Cooper, in his *Notions of the Americans,* says, "The high-spirited contributors to the little work thought the Congress did not pay a suitable respect to their request for a site in a more public situation. They were masters of the navy yard, and, in disgust, they caused their modest memorial to be put up in the center of its area. It may be doubted, after all, if any other situation so appropriate, or so touching, could have been found."

Description

"The monument itself consists of a rostral column of the Roman Doric order mounted on a pedestal to which the character of a sarcophagus is given. The whole forms a well proportioned pyramidal group of sixteen feet base and thirty feet in height. Four life-sized and two smaller human figures surround the column, the larger ones typifying America, Commerce, History, and Victory, and the smaller ones forming adjuncts to the figure representing America and themselves symbolizing posterity. On top of the column is an American eagle bearing a scroll with the federal motto 'E Pluribus Unum' on it. The column also has on the east and west sides each three antique rostra, and on the north and south sides antique anchors in flat relief.

"The pedestal has on its south side the inscription:

'Hic Decorae Functorum in Bello Virorum Cineres'

"The column with its pedestal stands on a square block of rather good proportions. It has an upper border of semi-circular compartments on which are sculptured in basso relievo, alternately, a Turkish turbaned mask and a trophy of Turkish arms. On each side of the block is a panel. That to the south represents in low relief a view of Tripoli, with frigates and gunboats in the foreground attacking the town. On the north side is this inscription: 'Erected to the memory of Captain Richard Somers, Lieutenants James Caldwell, James Decatur, Henry Wadsworth, Joseph Israel, and John L. Dorsey, who fell in the different attacks that were made on the city of Tripoli, in the year of our Lord 1804, and in the twenty-eighth year of the independence of the United States.' On the east side is: 'The love of glory inspired

them; fame has crowned their deeds; history records the event; the children of Columbia admire, and Commerce laments their fall.' On the west side is: 'As a small tribute of respect to their memory and of admiration of their valor so worthy of imitation, their brother officers have erected this monument.'

"The block on which these inscriptions are cut is raised upon three steps at three angles of which are placed three of the four life-sized figures already referred to as surrounding the column. At the southeast is a female figure with a diadem of feathers on her head, and a short, petticoat-like garment of ostrich feathers around her waist. She wears Roman leggins and shoes, but is otherwise nude, except for the garment about her waist. She leads up two children and represents America.

"At the northwest angle is a figure representing History. She is fully clothed and holds a book in her hand (the left) and a pen of bronze gilt in her right. She is looking up toward the column and is commencing to write.

"At the northeast angle is a figure of Commerce standing. His right hand points to the column, and in his left is the caduceus. This is the chief sculptural feature of the monument from the point of view of artistic excellence.

"At the northwest of the pedestal, or rather of the block that supports the pedestal and column, and therefore higher than any of the previously mentioned figures, is a Winged Victory. In her right hand she holds a wreath of laurel over the sarcophagus, and in her left is a branch of palm of bronze gilt.

"At the four corners of the base of the monument are four urn lamps of black variegated marble, with flames of bronze gilt, one such lamp at each corner, that is.

"The whole monument is placed on a square mass of solid freestone about five feet high and sixteen feet wide, and excepting the base the whole work is executed in white Carrara marble.

"The dimensions are:

"Foundation 15 feet 3 inches square and about 13 inches above ground.

"Masonry block 11 feet, 3 inches square and 71 inches high.

"Three marble steps 7 inches high each, and 10 feet 8 inches, 8 feet 9 inches, and 6 feet 10 inches square, respectively.

"Block supporting pedestal and column 44 inches high, with a smaller block 22 inches high between it and the pedestal, which is 7¾ inches high and about 15 inches square.

"The column is 42 inches in circumference or about 13.4 inches in diameter. It is about 14 feet high above the pedestal."

The foregoing is Latrobe's description of the monument as it first stood in the Navy Yard, Washington.

Of its place in the Washington navy yard, its conspicuous situation is shown in the old 1827 sketch of that yard, where it is marked as standing immediately inside the main gate, and in the midst of the main avenue, flanked by the flag pole and two captured bronze guns—the same which are now seen there. Tradition has it that Commodore Thomas Tingey, commandant of that yard during the first quarter century of its existence, was not enthusiastic in his reception of the monument there, not having been advised particularly of its history, purpose, authorization, destination, etc., but after it had been declined for the Capitol grounds (probably, on Latrobe's advice) and accepted by the Navy Department for the yard, it was Tingey who placed it so conspicuously, and who displayed deep indignation over its mutilation in August, 1814. It was said of this brave officer that he was the last to leave the yard after, by express direction of the Secretary of the Navy, he had set fire to it, and the first officer to re-enter it after the British marines marched away. Here his word was law, and he ruled the yard with a high but efficient hand. After his death, an outrageous story was jokingly circulated in naval circles to the effect that he had willed the navy yard to his family—the point of the yarn arising from his long tenure of office, and his rather dictatorial manner and method of administering it; and some air of truth may have been derived from the fact of his having left property adjacent to the yard to his heirs. Commodore Tingey was a distinguished citizen in and around the Capital, as well as an able, conscientious, and highly respected naval officer.

As to the two trophy guns mentioned, it seems a strange oversight and an unfortunate one that they should not have been removed with the monument, to which they naturally lend themselves, to Annapolis, when that beautiful memorial found its final resting-place.

But while it stood in its commanding position in the navy yard, it witnessed many stirring and momentous events: almost immediately after its erection, came the boom and roar and flame and fate of 1812, and the terrible history of 1814—the loud preparation of ships and gunboats at the yard, the war councils and hastening troops in that vicinity, the short blast of battle at Bladensburg within hearing, the retreating troops, the little president atrot on horseback, with the duelling pistols which had been loaned him by the Secretary of the Treasury bobbing up and down in the deep pockets of his long coat, while Barney lay at the spring, near where he had fallen, having his wounds washed and dressed by a British naval surgeon. Then, as news of defeat arrived, and all hope of defense vanished with the retreating forces beyond Georgetown, Tingey, in tears, but with steady step and voice, emerges from his quarters near by, and taking stand beside the monument to his dead comrades, obeys the orders of Secretary Jones, and gives the signal to fire the yard. Then succeeded that awful evening and night of destruction there, the abandonment of the yard, with its trophies and property, and the coming next morning of the enemy.

Then, three days later, on August 27, occurred the blowing up and abandonment of Fort Washington, a few miles down the Potomac, and the fall of Alexandria, in full view.

As the eventful years passed by, came an affair which touched very closely the soul of the monument—the general court-martial assembled in the Washington yard to try its sponsor and godfather, Commodore David Porter, on charges growing out of the cruise against pirates in the West Indies. Daily, distinguished visitors entered and passed under its shadow, and, in 1829, Tingey died there, gazing upon it.

Hull succeeded Tingey in command of the yard, and during the summer of 1829, at the request of the District Court, there was made in the yard a model of a ducking stool, which was exhibited before the judges, during the trial of Mrs. Anne Royall, on the charge of being a common scold. So states Sarah H. Porter, page 137.

After a quarter of a century had elapsed, the old agitation was renewed for its removal to a site in the west Capitol grounds, the former objections, as to the unfinished state of the building, no

longer existing, though, in fact, the building was far from completion, and Latrobe was no longer there.

In the dearth of data of the handling of the monument from time to time and from place to place, there has not been found any record of the discussion of the question of its removal from the yard. But this site had always had its advocates, and, it may be fairly conjectured, the much heralded spring-water supply, being piped from Smith's farm, several miles north of the city, may have been a factor in influencing the movement to give the monument a place of honor under the shadow of the great national building, for, as will presently be seen, this water became a distinct feature of its new setting.

The *U. S. Weekly Telegraph* of May 12, 1831, says: "It must be gratifying to our fellow citizens to learn that the beautiful monument in the navy yard . . . . is now undergoing a complete repair. The mutilated and destroyed ornaments are to be replaced, and the whole is to be removed and fixed upon the oval plat of ground on the upper glacis immediately west of the Capitol. It will there form an object of more conspicuous interest than in its former situation, and will, besides, add much to the beauty of the edifice." Then follows a quotation from the *Fredericksburg Arena,* of contemporary date, which opens with the interesting statement concerning the monument, "Though in a state of dilapidation, this beautiful specimen of the arts cannot be viewed without emotion," and closes with the statement that "the expense of the removal and repairs will be defrayed by the Navy Department."

The second session of the twenty-first Congress appropriated the liberal sum of twenty-one hundred dollars for the removal of the monument (1831) which, in 1808, they had refused a free passage of our customs, and the meager cost ($1,000) of its erection.

From: *American State Papers—* P. 37, Vol. 4

Removal of Naval Monument

Navy Commissioners Office.
November 24, 1831.

Sir:

The amount appropriated for removing and reconstructing the Naval Monument, was— $2,100.00

Of this sum the disbursements to the present time amount to—	1,502.50
There will be due to contractors on the completion of the work—	564.96
For extra work–	32.54
	$2,100.00

The inscriptions on the monument being very faint, it has been proposed to improve them; and for this purpose, should it be approved, there will be required an additional appropriation of one hundred and thirty dollars.

With very great respect, I am, Sir,
Your most obedient servant,
(Signed) JNO. RODGERS.

Hon. Levi Woodbury,
Secretary of the Navy.

Secretary Woodbury, in his annual report for the year 1831, said, "Under an appropriation made at the last session, the naval monument has been removed from the navy yard in this city to a site west of the Capitol. The expense has not exceeded the estimate, although, in addition to repairs, about two hundred dollars worth of labor, not included in the estimate, will be required fully to compensate the contractor, if he proceeds to renew the inscriptions, besides giving uniformity of color to the statues. But this, as the appropriation is already exhausted, must depend solely upon the liberality of Congress (Q)."

When completed, the monument stood just west of the nearly finished marble building, and was placed in the midst of an oval basin which contained nearly 79,000 gallons of fresh water, running in from a large pool above, and in which swam numerous gold fish. Sessford says the basin was of freestone, and Cook mentions the iron railing.

But it is to be feared that, as time went on, the monument, with its limpid pool, shrubbery, and gold fish, was slighted, and allowed to become dingy or bedraggled in appearance, for we hear of Porter's disgust upon his return to the United States when he learned of its removal, and saw it in "a muddy duck-pool," neglected and out of place. "About 1829, Commodore Hull, commandant of the yard, proposed to Commodore Porter the removal of the monument to a place near the Capitol, but P. objected, claiming that the navy yard was its proper element and the place for

which it was originally intended; and he made the same reply to a member of Congress. But while Porter was away from the country, the monument was removed to the Capitol grounds, and the obnoxious inscription (concerning its mutilation in 1814) was removed." When Porter returned and discovered the removal, his comments were characteristically bitter, and in the correspondence which ensued, he adds, "And, to cap the climax of absurdity, the Naval Monument had, as an evil omen, I presume, been placed in a small circular pond of dirty fresh water (not large enough for a duck paddle to represent the Mediterranean Sea." *A&N Chronicle,* April 18, 1839, pages 258-62. And in this Sessford appears to have agreed with him, for in 1834 he says, in his *Annals of Washington,* "The fountain is neat and ornamental, but too confined. The Naval Monument loses its effect from being so near the Capitol. Were it removed to the island in the Botanic Garden, properly elevated, with a sufficient sheet of water around it, it would be seen to more advantage." This note of disapproval was still pursuing the monument when a little later Watterston, referring to it, says: "This neat and beautiful monument was formerly erected in the navy yard, a much more appropriate place than the one in which it now stands," and, no doubt, he with many other critics, was gratified when it was finally determined to remove the monument again—this time to its final, and quite appropriate, resting-place—the handsome grounds of the United States Naval Academy at Annapolis, Md., which occurred in the summer of the lowering year, 1860, the appropriation passing for it on June 22.

The progress of the removal was mentioned from time to time by the Washington correspondent of the *Baltimore Sun,* as follows:

August 2, 1860: "The Naval Monument is down, and all except the figures are taken to the navy yard, from thence to go by boat to Annapolis."

August 13: "The Naval Monument is at the wharf being put up for transportation to Annapolis, and will probably be sent off this week."

September 4: "The statuary of the Naval Monument is about to be shipped on the steamer *Annacostia.* She is waiting for repairs to her machinery before leaving."

October 15: "Tomorrow the *Annacostia* will leave with the remainder of the Naval Monument for Annapolis."

And on November 5, the Annapolis correspondent of that paper stated: "Workmen are now engaged in re-erecting the Naval Monument."

Thus, after lying forlornly in its crates a second time in the navy yard at Washington, this exquisite memorial finally reached its welcome place sixty-two years ago, there, in a congenial atmosphere, to abide undisturbed permanently.

No record has been found of the adoption of the new name—The Tripoli Monument.

Aside from its charming character as a work of art, it has an eloquent story to tell—of heroic sacrifice for cause, flag, and country, and of no less admirable qualities of shipmates who were faithful to the memory of their heroic dead.

It is well placed, where so many thousands of young officers pass and repass it daily, catching the thrill of its story, and learning the very names of its martyrs, as a part of the training and character they receive and absorb amidst the inspiring experiences and atmosphere of that institution.

Well would it be for all Americans to know more of the story of our monuments.

The Tripoli Monument stands as an eloquent memorial of brave patriotism and reckless devotion to lofty duty, and as a deathless mark of gratitude and loyal remembrance by surviving shipmates.

As fair as their record of glory,
It stainless stands under the sky,
A beautiful, white sculptured story,
Of deeds that we cannot let die.

Sources: Alden, Latrobe, Watterston, *Columbia Historical Society Reports, National Intelligencer, American State Papers, Naval Chronicle, Annalitical Magazine,* David Cook, Mr. Fairman, arcurator, Office of the Architect of the Capitol, etc.

DISCUSSION

An Administrative Flagship

(SEE PAGE 1299, WHOLE NO. 234)

LIEUTENANT COMMANDER FRANK LUCKEL, U. S. NAVY.—Captain Taussig's well presented paper contains many good arguments in favor of the administrative flagship. Apparently by the term "administrative flagship" is meant a non-fighting flagship. This matter appears to be a recurrence of the old question of battleships versus special vessels such as battle cruisers, submarines, aircraft, destroyers, cruisers and other special types. A well balanced fleet comprises battleships, special types and non-combatants. The Commander-in-Chief is concerned with every type of vessel in his fleet. Judged solely from this viewpoint, it appears sound to station the Admiral on a fast independent vessel.

However, while the Commander-in-Chief is no doubt concerned with every subdivision of his fleet, there is a considerable school that would regard his paramount duty to be with the battleships. Submarines, aircraft, scouts and destroyers are considered to be mere adjuncts to the battleship fleet. Each type has its rôle which is played *with reference* to the battle fleet. Their station both before and during the battle is determined *with reference* to the battleships. The officer in immediate command of submarines, aircraft and destroyers should have a technical knowledge of his particular type. He would operate during battle in accordance with doctrine subject to such orders as he may receive from the Commander-in-Chief.

If the fact be accepted that scouts, battle cruisers, destroyers, aircraft and possibly submarines take their battle stations with reference to the battle fleet, then the officer in control of the battleships controls the fleet. The question now arises as to whether the Commander-in-Chief can control the battleships to better advantage from an administrative flagship located outside of gunfire range than he can from the leading battleship. If he be on board the administrative flagship he must rely entirely upon signals of some form. He also must rely very greatly upon the intelligence and loyalty of the officer in immediate command of the battleships. His perspective of the battle should be better in so far as concerns the fleet as a whole. He would, however, not be so well informed with regard to the main action between the battleships. It is a question whether this is desirable.

If the Commander-in-Chief be on board the leading battleship he is in immediate control of the battle fleet. He can keep in constant touch with the progress of the action and take advantage of all favorable op-

portunities. His control of the battleships does not depend entirely on signals since the column is flexible and the course can be changed without signal. Forces composed of special types would operate according to doctrine and *with reference* to the battle fleet.

An ideal fleet flagship would be a very heavily armored battleship having somewhat higher speed than the other battleships. Ample quarters should be provided for the Admiral and his staff. Facilities for chart and game board maneuvers should be provided. The arrangement of masts and antennæ should permit of long range radio communication. The cruising radius should be sufficient to permit of the strategical administration of the fleet as a whole. The above features can only be obtained by a sacrifice of the offensive power. It is in consequence proposed to reduce the number of turrets in so far as necessary. This reduction will reduce the number of turret officers and hence fewer staterooms will be required for the ship's officers. It will also permit a better arrangement of the masts in order to facilitate communication by signals or radio. This flagship would be able to take its place at the head of the battle fleet. The unusually heavy armor would insure a long life. "Fighting ships are not built that way" but why not begin doing so at the next opportunity.

In the administration of the fleet and the conducting of a strategical campaign the Commander-in-Chief would be "always tied down to a slow moving battleship." However, this battleship would be the fleet flagship and could take the Admiral wherever his presence is required. The "battleships should train and operate together." However, the absence of the fleet flagship would give the second in command an opportunity to gain experience in handling the battleships. This training would prove very valuable in case the fleet flagship should be sunk and the command pass to the second in command. The flagship's "separation from the other battleships weakens the fleet as a whole." The converse of this is that upon its rejoining the other battleships the fleet would be strengthened. "The general headquarters must be entirely independent of the subdivisions that compose the fleet as a whole." The fleet flagship is sufficiently independent of the battleship squadrons under the present organization. The fleet flagship cannot go to a distant port "without interfering with the training of any unit of the fleet." However, if all opportunities for training are taken advantage of, the flagship's fighting efficiency should not be seriously reduced.

"The commander of an army now takes a position from which he can best handle the situation, and this position is *not* in the front line." The Admiral of the fleet should undoubtedly be permitted to take the most advantageous position. Such a position is believed to be at the head of the battleships. However, he would not be restricted to this position and could go wherever most needed. If the Admiral were placed on board an administrative flagship his freedom of movement would be seriously restricted since he "may be anywhere *not too near* the fighting front." This inability to enter the battle is believed to be a serious handicap.

"Because an administrative flagship is not a fighting unit" is held to be a fatal defect. "It has been customary to have a peace organization and a war organization. This, of course is fundamentally wrong." How the addition of an administrative flagship to the fleet would create a war organization is not apparent.

"Our Commanders-in-Chief have been so much more intimately connected with the battleships, it is natural that their efforts for efficiency have been devoted mostly to this class of vessel." This condition probably exists and it is believed that it is for the best. The battleships are the backbone of the fleet and their efficiency will probably have a predominating influence in case of battle. Furthermore, the Commander-in-Chief probably wisely intrusts the handling of the special wings to subordinates who have specialized in their particular types. "Being attached to one of the subdivisions of a fleet,—owing to the perversity of human nature. narrows his viewpoint." Since the Admiral must be attached to some vessel it would appear desirable to "narrow his viewpoint" in the direction of the main battle fleet rather than elsewhere. "The battleship is expensive to operate" whether or not the Commander-in-Chief is aboard. This argument can have little weight considering the cost of operating the navy as a whole. Is it "illogical to place the Commander-in-Chief on a vessel that is the most costly to move from place to place," if his presence there will help to win the battle? "The conversion of one of the old armored cruisers" into an administrative flagship would, it is believed, produce a flagship having most of the disadvantages of the battleship flagship without its advantages.

"The tactical game board and the chart maneuver" are most important facilities for the training of all officers. Every battleship could and should be fitted to permit such training. The chart maneuver does not require any extensive facilities. Without doubt, considerable danger to the radio aerials and signal yards may be sustained by the battleship flagship in action. Also the position of the administrative flagship on the unengaged flank might facilitate signalling. The Commander-in-Chief would be in a safer position if located outside gunfire range. These are advantages in favor of the administrative flagship which are conceded. There are no doubt many other advantages but we should consider the question thoroughly before stationing the Commander-in-Chief on a non-fighting vessel.

Promotion by Selection

(SEE WHOLE NO. 235, PAGE 1487)

REAR ADMIRAL ALBERT GLEAVES, U. S. NAVY.—Rarely has the Naval Institute published a more timely paper than the one under discussion. Those who will not agree with Mr. Barnes' conclusions, must at least acknowledge the excellent presentation of his arguments.

The service has been disturbed many years by the question of promotion by selection and when the present method was established by law, it was hoped that a satisfactory solution had been found. After six

years, however, it is safe to say that at least a majority of the Navy believes that it has failed, and are now looking for something else. Better the old Plucking Board in spite of the final grievous mistakes which put it to death.

No one probably denies that there should be a method by which the worthy are rewarded and the unworthy cared for otherwise, and the old machinery was suitable for the purpose had it been properly used. There has always been selection for duty regardless of seniority, and this as Mr. Barnes remarks is the true selection "that carries with it no jealousy, injustice or hatred,"—or at least the minimum amount.

The present law is unfair in not requiring the board to inform an officer passed over the reason for this action. To try, and condemn a man *in camera,* is to violate every principle of justice, and disregards—if my history is correct—the fundamentals of the Magna Charta, the Bill of Rights, and the Habeas Corpus Act, for all of which much blood has been spilled. It is un-American. It certainly does not make for the best interests of the service.

If the present method—it is not a system—of promotion by selection has benefited the service in a few cases of accelerated promotion, the benefit has been offset by the consequent humiliation inflicted upon those meritorious officers who have been passed over in many cases by others not distinctly of superior ability, but who are denied the privilege of retirement.

It was frequently said in the clubs and elsewhere when the first Selection Board met in 1916, that its proceedings would establish a precedent for succeeding boards. They did not. The first board attempted to break away from seniority and *select.* After six years' trial, the net result of "selection," has been a topsy-turvy re-arrangement of the lists in the upper grades, by the subsequent promotion of nearly all the officers passed over, but with their precedence lowered. Nothing can be more subversive to discipline and efficiency than repeated shifting of rank and precedence. With such instability of seniority no one knows where he stands. Under such conditions military hierarchy vanishes.

A cruelty begotten by the Star Chamber method is the havoc that gossip often plays with an officer's reputation. The board of course assigns no reason for passing over any one, and preserves a dignified silence. Then those twin imposters, Rumor and Gossip, get to work. I recently listened to a detailed and vicious account of why a certain officer had been passed over, which I knew personally to contain only the merest thread of truth, and the alleged facts to be absolutely incorrect.

A serious indictment of the operation of our Selection Board is that it decreases initiative and encourages officers to play safe. Many fear to incur the disapprobation of their seniors, and what is even worse, the criticism of their juniors, lest their chance of promotion or preferment be imperilled. The result is sycophancy working downward as well as upward, which of course reflects on those so affected, senior as well as junior.

No one doubts the sincerity of the board which is sworn to perform its duty without prejudice and partiality, having in view the best interests of the service. I have served on three boards, and I have never seen men work more conscientiously, or strive more earnestly to do their duty, with an eye single to the good of the service. But I believe we failed in part, simply because we are human.

A well known Admiral, a member of the board, once remarked, "If we sat here and deliberated for six months we would even then adjourn feeling that we had done injustice to some one." Humanly speaking it cannot be otherwise.

I concur with Mr. Barnes that selection should be in the lower grades, up or out.

We cannot do better than to adopt the English system of promotion by seniority after reaching command rank.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 4,824. New members, 5. Resignations, 1. Deaths, 1: Ensign A. O. Harrington, U. S. Navy.

Practically the whole service receives the benefit of the PROCEEDINGS, yet many officers who read it monthly are not members, and therefore contribute nothing to the support of the Institute.

The publication of the PROCEEDINGS involves a monthly deficit that is a tax on the resources of the Association. The loss of 653 members during the last year is a serious matter, as this deficit can best be overcome by an increase in the membership roll. However, the gradual decrease in membership during the last few years may be looked upon as an aftermath of the war. Earnest effort is being made to counteract this, and there are encouraging signs that it will soon stop and the tide turn the other way. If the Service will give the Institute a little more support, it will not be necessary either to curtail the PROCEEDINGS or to increase the yearly dues. *Members are requested to urge non-members to join.*

Dues The annual dues ($3.00) for the year 1922 are now past due.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid for at one-half the rate for original articles, or about $2.25 a page.

Articles The Institute desires articles of interest to all branches of the service, including the reserve force. Attention is invited to the fact that the submission of articles

is not limited to members, and that authors receive due compensation for articles accepted for publication.

The attention of contributors is requested to the difficulties attending the publication of long articles in the PROCEEDINGS. The number of pages in each issue is limited. Also, members have criticized the unbalanced effect resulting from the publication of long, discursive papers. It follows that compact, well digested articles are more likely to be accepted for early publication.

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As soon as practicable after the publication of books on subjects of professional interest, the Institute aims to publish authoratative reviews of them.

The Board of Control has authorized increased compensation for book reviews in order to improve these columns in the PROCEEDINGS.

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The Institute Book Department will supply any obtainable naval, professional, or scientific book at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books should be considered. The cost will not be greater and sometimes less than when obtained direct from dealers.

Attention is invited to the following books that are additional to those listed in our advertisement columns:

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Address orders to: U. S. Naval Institute, Annapolis, Maryland.

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To insure the delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers notify the Secretary and Treasurer of every change of address, without delay.

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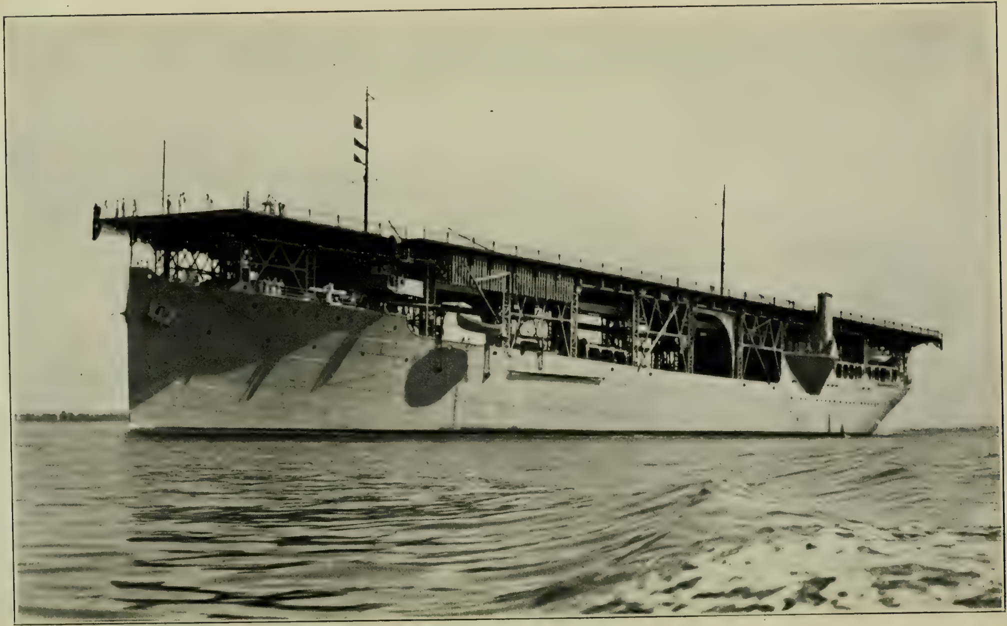
The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished can be greatly reduced if the reprints are struck off while the article is in press. Twenty copies of reprints are furnished authors free of charge. When the article is submitted, authors are requested to notify the Secretary and Treasurer of the number of additional reprints desired.

INFORMATION INDEX



U. S. S. Langley

For description see Page 1967

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER F. W. ROCKWELL, U. S. NAVY

and

LIEUTENANT COMMANDER J. B. HEFFERNAN, U. S. NAVY

GENERAL ARRANGEMENT

GREAT BRITAIN

SERVICE PAPER EDITORIALS.—NEW CONSTRUCTION.—According to an Admiralty announcement quoted by a London evening paper on Thursday, "it is intended to start on the building of two new battle cruisers in the coming autumn." The use of the term "battle cruisers" in this connection is probably a journalistic slip, since it is most unlikely that the new vessels will belong to that type. On a displacement of 35,000 tons it would be impossible to provide a high turn of speed without unduly forfeiting offensive and defensive power, to both of which qualities the Naval Staff is known to attach great importance. In well-informed circles it is regarded as improbable that the speed of the new ships will be in excess of that of modern battleships, the fastest of which are the Japanese *Nagato* and *Mutsu*, said to be good for 23½ knots at full power. It the tactical doctrines of pre-war days still governed design there would be some reason to anticipate very high speed in the new vessels, with a corresponding sacrifice of protection, but today the trend of naval opinion is rather the other way. In view of the enormous weights involved by the armament and defensive features now in vogue, there would be but a relatively small margin for the machinery in a vessel of 35,000 tons, and if Sir E. T. d'Eyncourt contrives to rival the Japanese *Nagato* in this respect he will have accomplished a remarkable feat. The statement that the two battleships will be laid down in the coming autumn is at variance with previous official announcements. In the First Lord's memorandum on the current estimates the date of commencing the work was given as "early in 1923," and the smallness of the vote for new construction during the present financial year renders it improbable that much progress could be made on the vessels up to the end of next March, even if they were begun at an early date. So far, however, no major contracts for the work have been awarded.

VANISHED SQUADRONS.—*The Engineer* publishes some striking figures to illustrate the enormous reduction which the material of the Royal Navy has undergone of late years. After pointing out that the withdrawal of the last six ships condemned under the Limitation Agreement will bring the fleet down to eighteen battleships and four battle cruisers, it goes on to compare this establishment with that which was maintained respectively in August, 1914, and at the date of the armistice. When the war began we had twenty-two dreadnaughts and nine battle cruisers ready for service, in addition to forty pre-dreadnaughts and thirty-four armored cruisers, while ten battleships and one battle cruiser were building or fitting out. In all, therefore, we had forty-two all-big-gun ships and seventy-four armored vessels of the older type, representing a grand total of 116 ships. During the war we added three battleships, which had originally been ordered by foreign Governments, and two battle cruisers, these five ships exactly balancing our war losses in the dreadnaught class. Our strength in this type, therefore, remained constant, but the heavy wastage among the pre-dreadnaught material was not replaced. When the fighting ended we had in service the following: dreadnaught battleships, thirty-three; battle cruisers, nine; pre-dreadnaught battleships, thirty, and armored cruisers, seventeen—exclusive of several other ships used for subsidiary duties. Of these eighty-nine vessels only twenty-two now remain, a fact that reveals the thoroughness with which our scrapping policy has been carried out. The pre-dreadnaught fleet has completely disappeared, together with fifteen all-big-gun ships. Minor vessels have, of course, been discarded in still greater numbers. Roughly speaking, seventy-five per cent of the destroyers have gone, and the submarine flotilla has been reduced from 130 boats to fifty-eight. Even when the deletions made under the Washington agreement are taken into account, it will be found that Britain has scrapped far more fighting ships than all the other Powers combined.

RETRENCHMENT IN AUSTRALIA.—It is obvious from the details given in our columns last week that the demobilization of the Royal Australian Navy has been much more drastic than is indicated by the official list of ships available. Altogether there are thirty-three units under the Australian flag, and of these no fewer than twenty have been placed out of commission. The remaining thirteen are not all fighting ships, five of them being auxiliary or depôt vessels. There are six submarines of a very effective type—*J* class, of 1,200 tons, with a surface speed of 19½ knots—but they have all been paid off. As the result of this sweeping system of retrenchment, a sudden emergency would now find Australia unable to send to sea more than three or four light cruisers, three destroyers, one sloop, and the auxiliary ships mentioned. Even if sufficient officers and trained men were at hand to provide complements for the vessels now laid up, it would be a considerable time before they could be regarded as efficient for war service. Especially would this be the case with the submarines, whose war value is largely a matter of prolonged and intensive training. In spite of this radical cut in naval expenditure, the Australian papers continue to express alarm at the growth of Japanese sea power, yet few of them advocate the only policy by which this uneasiness could be allayed, namely the maintenance of an Australian fleet unit as strong and efficient as the resources of the Commonwealth would permit. Such a squadron could probably be kept up by a smaller contribution per head than we at home are called upon to pay for national defense. It appears, however, that the late Admiral Dumaresq's plain words to his compatriots on this score have not yet taken effect.—*Naval and Military Record,* 23 August, 1922.

DOMINIONS AND NAVAL DEFENSE.—The cable from the *Morning Post's* Wellington Correspondent contained in the issue of the 21st inst., giving a summary of the Admiralty suggestions regarding New Zealand's naval development, is the first information made public in this country concerning the matter. As it may be assumed that the general principles expressed by the Admiralty refer also in varying degree to naval assistance by other Dominions, it is of interest to examine the suggestions in detail.

The governing idea is that during the period of financial stringency, which is affecting the Dominions as it is this country, the organization of Dominion Navies should be such that they are capable of rapid expansion when times improve. The basis of this organization is a seagoing squadron, while the means of expansion are light cruisers and ocean-going submarines. The Admiralty further suggest that all reserves should be supplied locally, and that the necessary provision for the local squadron in the matter of bases, docks, reserves of stores and fuel should be made. Trade protection, in so far as it concerns local waters, is another responsibility which the Admiralty are seemingly desirous of delegating to the Dominion, to which end it is suggested that storage for guns for defensively armed merchant vessels, together with trained personnel for their operation and to form the crews of escorting vessels, should be provided by the Dominions. The elaboration of the mobile defense of ports, including mine-sweeping organization, completes the purely local measures that have been suggested.

In the matter of the wider Imperial sphere the idea is that the Dominions should assist financially, or by the provision of material, toward equipping the Empire with naval bases. The suggestions, therefore, fall into two clear divisions, local and Imperial. They also appear to have been framed with a definite strategical object in view, and mark a considerable advance in the putting forward of clear-cut principles.

This is not the time to discuss the question of local navies as opposed to an Imperial Navy; but it is possible to infer from the Admiralty suggestions what is the strategical object they have in view. To take first the Imperial sphere—the equipment of the Empire with naval bases. This is no doubt aimed at increasing the mobility of the Navy as a whole, and rendering it eventually possible to move rapidly a large force to any threatened quarter of the Empire, and to maintain it there for a prolonged period if necessary. At present, owing to a lack of fully-equipped naval bases and fuelling stations outside home waters, the mobility of the fleet is very seriously prejudiced and a grave risk is thereby incurred.

But, however mobile our main fleet, circumstances are conceivable which might render it necessary for the Dominion naval forces, aided by such squadrons of the British Navy as were on the spot, to deny to an enemy the control of local communications until such time as the main fleet could arrive and occupy a strategical position from which it could either contain the enemy's main fleet or bring it to action. The action of the local forces under these conditions would necessarily be of a delaying character. Indeed, it could be no more.

There is but one form of naval force which can adequately perform the function of delaying a superior force in the attainment of its object, which may be assumed to be the control of local communications for invasion or other purposes a fleet in being. A "fleet in being" may be defined as "a fleet strategically at large, not itself in command of the sea, but strong enough to deny that command to its adversary by strategic and tactical disposition adapted to the circumstances of the case." The submarine, owing to its power of submerging at will, is capable of maintaining itself strategically at large under conditions which would inevitably require a weak fleet, composed only of surface craft, to shut itself in a defended harbor in order to avoid annihilation.

On the other hand, submarines can only remain strategically at large until such time as the other side have developed fully their counter-measures. But that takes time, and time, in the case under discussion, means everything. It also follows that the greater the radius of action of the submarines, the longer before the full force of counter-measures can be applied. Therefore, for a modern fleet in being or delaying force, ocean-going submarines with long range are preferable to small submarines tied down to coastal waters. In addition, until his counter-measures are in full operation, they, in conjunction with aircraft, prevent an enemy establishing himself within easy striking distance of his objective. Considerations such as these have, no doubt, influenced the Admiralty in urging on the Dominions the employment of ocean-going submarines.

The suggestions regarding local protection of trade, bases, docks, and mobile defense speak for themselves and do not require elaboration.

The Prime Minister of New Zealand is reported as having said that in present conditions it was impossible to do everything, but they must make a beginning. Evidence of this goodwill is forthcoming in the report that a sum of £400,000 is to be spent on naval defense next year, but it must be admitted that this will not go very far in meeting the Admiralty suggestions. Australia, on her part, has been drastically pruning her Navy. There are now in full commission only three light cruisers, one flotilla leader, two destroyers, and a sloop. All the six *J* class submarines, belonging to Australia have been paid off, together with nine destroyers. It will be recognized that, under such conditions, any form of combined training of all arms is out of the question.

Canada has gone to the length of paying off the whole of her sea-going squadron, consisting of a light cruiser and two destroyers. The latter will be kept in reserve, but Canada's active Navy is now represented only by four trawlers, two on the Atlantic and two on the Pacific coast. These trawlers are to be used for training Royal Naval Volunteer Reservists. South Africa, of course, has only just made a beginning. She, too, is concentrating on the enrollment and training of R. N. V. R., and has two trawlers and a sloop for the purpose.

It is obvious, therefore, that a very great deal remains to be done before we can have an Imperial Navy organization on the lines suggested by the Admiralty. That the need for it is urgent and pressing, nobody who has studied the situation will deny; but it seems that it will not be brought home to the great bulk of the people at home and in the Dominions until the case is put fairly and squarely before an Imperial Conference on Naval Defense, which should be called without delay.—*London Morning Post,* 24 August, 1922.

BATTLESHIP COMPARISONS.—The backbone of our post-war navy is formed by the ten battleships of the *Royal Sovereign* and *Queen Elizabeth* classes, nine of which are kept in full commission. Small though it be in point of numbers, this force is a compact, homogeneous, and formidable battle fleet. The oldest ship, *Queen Elizabeth,* was completed nearly eight years ago, and the last to enter service was the *Ramillies,* which hoisted the pennant in September, 1917. So rapid have been the developments in naval science during the past few years that all these fine vessels would soon have become obsolete but for the Washington limitation scheme, which, by cancelling most of the post-Jutland ships building for the principal navies, has given their predecessors a new lease of life.

Compared with all but the very latest addition to the American and Japanese fleets, the ships we have named are, relatively speaking, still in the front rank, and will continue to occupy that position so long as the naval holiday lasts. For this reason, the expenditure of fairly large sums on refitting them from time to time is quite justifiable. The *Royal Sovereign* rejoined the flag lately after a long spell in dockyard, where she

was fitted, among other improvements, with bulge protection. The *Royal Oak,* it is understood, is now receiving the same treatment, one result of which is to increase the beam of the ship by about thirteen feet. When this job is finished all the five ships of the *Royal Sovereign* class will be equipped with that form of bulge which has proved so valuable a defensive against underwater attack, and it is believed that each could stand the explosion of at least two modern torpedoes without sustaining mortal injury. Owing to the addition of the bulge and other structural modifications, the normal displacement has risen to about 29,350 tons, increasing at full load to 33,500 tons. According to "Jane," they are fine and steady ships, those with bulge protection being splendid gun platforms, but they "suffer rather from reduced freeboard."

Partly as a result of the publicity which she received at the time of her launch, and partly owing to her dramatic appearance at the Dardanelles early in 1915, the *Queen Elizabeth* has for long been regarded by the general public as the most powerful type of battleship afloat. So she certainly was when completed, but today there are other ships which surpass her in fighting power. On paper she is inferior to the *Royal Sovereign,* for she lacks that special underwater protection which has come to be regarded as a sine qua non, but even so there are many officers who believe her to be the better all-round ship. Bulges could, of course, be fitted to the *Queen Elizabeth* and her four sisters, but to do so would bring down their speed by at least a knot, and probably more, and apparently it has been decided that the sacrifice is not worth while. These ships are sometimes compared with the very latest American and Japanese battleships, to which they are in some respects inferior, but it is fairer to match them with a contemporary, such as the U. S. *Nevada,* when the comparison is more favorable to them.

It must not be forgotten that vessels like the Japanese *Mutsu* and the U. S. *Maryland* were designed several years later by constructors who had a good deal of war data to go upon and a much larger displacement at their command. That we could have produced something better than the *Queen Elizabeth* in the way of battleships if the building of such vessels had continued in this country is evidenced by the Hood. Although this ship was designed in 1916, she would not have been outclassed to any serious extent by the American or Japanese battle cruisers which were laid down several years later. The American ships, it is true, were to have been 1½ knots faster and would have carried 16 in. guns, but their protection was from all accounts much inferior to the *Hood's.* It is a pity that the plans for the "modified *Hood*" class, since abandoned, cannot be disclosed, for they would have shown our post-war designs to be second to none as regards boldness of conception and the practical adaptation of war experience.—*Naval and Military Record,* 5 September, 1922.

BUILDING CONTRACTS FOR NEW BATTLESHIPS.—There is something almost pathetic in the eagerness with which the industrial world is awaiting the release of the new battleship contracts. A few years ago the impending allocation of two new capital ships would have caused only a ripple of interest in labor circles, but today it is regarded as an event of supreme importance. The shipbuilding yards throughout the Kingdom are in urgent need of work. Not only is naval construction almost at a standstill, but there is also an unparalleled slump in mercantile tonnage, and the two phenomena, coming together, are having a most serious effect on the economic situation. In these circumstances it is not surprising that the placing of every new Admiralty contract should excite tremendous interest. Labor leaders who ordinarily condemn the building of warships on principle are as eager as "capitalists" to secure for their districts a share of the work, and in recent months those behind the Parliamentary scenes have been edified by the spectacle of Labor stalwarts pulling every wire

within reach to accelerate the laying down of the new super-dreadnaughts.

It has been evident for some time past that the Royal dockyards were hopelessly out of the running, in spite of the efforts made by their Parliamentary representatives. The heavy cost of enlarging the slips at Portsmouth and Devonport has been cited officially as a reason for disallowing dockyard claims in this connection, though Admiralty spokesmen have admitted that the slips will have to be lengthened sooner or later. The real grounds for the decision to build the new vessels by contract are probably to be sought elsewhere.

According to the latest information, the contracts for the new battleships will be awarded late this autumn. The drawings are ready down to the last detail, and the delay in placing the orders is simply due to financial causes beyond the control of the Admiralty. Rumors that the building of the ships is to be held up indefinitely or altogether abandoned in deference to the views of the anti-battleship school may be dismissed as inventions. We learn on good authority that no such step has ever been contemplated.—*Naval and Military Record,* 13 September, 1922.

OVERGROWN AIRCRAFT CARRIERS.—According to the *Navy* there is a strong probability that Japan will not persist with her scheme of transforming the half-built battle cruisers *Amagi* and *Akagi* into aircraft carriers. Our contemporary adds that Japanese constructors have prepared plans for a smaller type of carrier, which is thought to be more suitable for the purpose than the 33,000-ton vessels into which the battle cruiser design would have to be modified in order to keep within the limits of the Washington agreement. In another part of the same issue attention is directed to the menace that the low-flying aeroplane dropping small bombs —as the *Snipes* did in the recent *Agamemnon* test—will represent to the big aircraft carrier, which would be rendered unserviceable if her flying deck was badly holed by the explosions.

We have repeatedly called attention to this danger, which would be intensified if the ship were exposed to the fire even of small caliber guns using high-explosive shell. In our opinion it is a powerful argument against building these huge aircraft carriers, and one that may have influenced the Admiralty in designing the *Hermes* on a basis of only 10,950 tons. Provided such a ship meets the essential requirements, it would seem much the wisest policy to build three carriers of this type rather than a single ship of thrice the displacement. Another objection to the practice of converting battle cruisers which has been adopted abroad is belief, widely held in our service, that a really satisfactory aircraft carrier has to be designed as such, and cannot be improvised.

DESTROYER DEVELOPMENT.—The destroyer *Worcester,* having completed her trials at Portsmouth, is to replace the *Violent* in the Fourth Flotilla of the Atlantic Fleet. The new boat is the last of a very large batch, known as the *W* class, designed in the latter days of the war, and, in fact has been under construction since 1918. Her displacement is 1,325 tons, and with turbines of 27,500 shaft horsepower she is designed for a speed of 34 knots. In no type of naval unit has the relative growth of size been so great during the present century as in the destroyer class. If we hark back to the Navy Lists of twenty years ago we shall find that the biggest destroyer then in commission was the *Success,* of 350 tons and 6,000-horsepower.

The war did not result in any great increase in the tonnage of torpedo craft. In 1914 we possessed a large number of destroyers ranging between 900 and 1,000 tons, and of 24,500 shaft horsepower. The additional displacement since then has been applied to the mounting of heavier armament and the increase of fuel endurance. Before the war the latest destroyers carried three 4-in. guns, which were outclassed by the weapons

of the German submarines. The *Worcester* type mount four 4.7-in. guns, of fifty-calibers and very high muzzle velocity. They also carry about twenty-five per cent more oil than their immediate pre-war predecessors, which gives them a much wider sea-keeping radius.—*Naval and Military Record,* 12 September, 1922.

DISPOSAL OF CONDEMNED WARSHIPS.—Mr. Amery (to Mr. Thompson): "No decision has yet been made regarding the method of disposing of the vessels to be scrapped under the Washington Treaty, but every effort is being made to secure such benefit to the National Exchequer and assistance to employment as is consistent with the fulfilment of the Treaty. The Admiralty have discussed the question in detail with the National Federation of Iron and Steel Manufacturers and this body, at the suggestion of the Admiralty, is at present negotiating with the ship breakers. One battleship is being used as a target for gunnery and bombing experiments." (To Dr. Murray, who asked whether ten large ships, including the *Lion,* are being sent over to Germany in order to be broken up there), Mr. Amery said: "If it is possible to get ships broken up in this country we endeavor to do so."—*Army, Navy, and Air Force Gazette,* 26 August, 1922.

NEW BRITISH SUBMARINE.—The British public has begun to be interested in the submarine *X-1,* the biggest underwater craft ever designed, which is now rapidly reaching the launching stage in the housed-in slipway in Chatham dockyard. The very greatest precautions are being taken to prevent any information concerning her details becoming public, the end of the slip having been screened in order to prevent any sight of her hull being obtained from ships passing up and down the river Medway, but it is known that she is to be an epoch-making vessel, who embodies in her design all the lessons learned during the war and from careful examination of the German *U* boats that fell into our hands after the armistice. It is rumored that she is to be both bigger and faster than the famous *K* boats, which had a displacement of some two thousand six hundred tons submerged and a surface speed of twenty-two knots with turbine engines. In other respects these *K* boats were not altogether favorites, and the new vessel is understood to have eradicated all their defects and to be the very last word in design from every point of view.

At all events, all submarine construction is waiting upon her completion and trials, and two boats of the *L* type which we thought worlds of at the time of the Armistice, and which were taken down to Chatham dockyard for completion when the contracts with the private builders were cancelled, have been laid aside in a basin without any effort made to put in the work necessary. It is all very well to talk of super submarines and to build wonder vessels of this sort, but they are useful for their purposes and their purposes only, and it is hoped that neither the authorities nor the public will forget that during the war most of the really wonderful work was done by the little old boats of the *E* type, some of which were certainly not in their first youth by the time they had finished worrying the Huns.—*Our Navy,* 15 September, 1922.

FRANCE

COMMENTS ON THE MANEUVERS: FRENCH V. ITALIAN NAVAL EXPENDITURE: REVIVING THE DIRIGIBLE FORCE.—The series of maneuvers just concluded between the Salaun battle squadron and the Lequerré and Schwerer coastal forces are unimportant if judged by the size and number of ships that took part in them, but they have all the same provided splendid training for many thousand seamen and supplied valuable data, as they had for object no longer blockade or fleet action, but the study of the new problems of coastal defense under the changed aerial and ballistic conditions.

Some light has been thrown on the value of coastal flotillas for the command of territorial waters and of narrow passages. Strategic strongholds such as Brest are to become factors of offense of ever-increasing radius of action through the multiplication of large submarines, seaplanes and dirigibles, and small islands such as Ushant, Groix, and Belle-Ile will henceforth play a momentous rôle in the defense of coasts. But it has also been found that a numerous and very costly force will be necessary, together with a totally new organization, for effectively guarding the towns of the littoral against deadly surprise attacks by seaplane mother-ships, those capital ships of tomorrow.

The courteous remarks which Major Fea, of the Italian Navy, has been good enough to send to the editor of *The Naval and Military Record* concerning my articles imply (1) that France is leading the pace in the matter of armaments as compared with Italy, and (2) that no antagonism exists between the two navies. Arguments cannot alter facts. The former discrimination between military and naval expenditure has no longer any *raison d'être.* Army supercannon and aviation have become naval weapons, and it is a fact officially established that whilst the fighting expenditure of France in 1922 as compared with 1914 Budgets has increased by ninety per cent, the percentage of increase for Italy is 372 (Budget Report by Signor de Vava), 290 for Japan, 275 for Spain, 181 for Great Britain, and 174 for America. Since 1914 up to the present year the "Imperialistic" Gallic Navy has not laid down a single surface fighting ship, not even completed the pre-war destroyer *Gabolde,* whereas Italian flotillas have received twenty-two Italian-built destroyers and seven leaders, totally reversing the pre-war situation to the detriment of France. The antagonism it would be futile to deny of the strides and pretensions of the fine Italian Navy the hostility of the Italian Press says enough. Frenchmen, while full of goodwill for *la sœur latine,* cannot be required to be blind and deaf: better call a spade a spade.

Noteworthy change is taking place in the situation of the French Navy in what concerns the utilization of dirigibles and preparedness for aeronautical warfare. Up to the first months of 1922, complete neglect had been prevailing in what regards both the two zeppelins surrendered by Germany and the twenty odd serviceable dirigibles that had survived the war, this being the twofold result of lack of credits and of want of faith in the gasbags that have been profusely derided in service papers. Then French experts who made investigations in Germany and studied the possibilities of helium and of another non-inflammable gas, brought new facts to the knowledge of the Paris Admiralty, and when Admiral Lanxade (curiously enough a noted gunnery specialist), became head of the newly-created Aeronautical Department he decided to revive the gasbag service and to train dirigible crews in all heavier-than-air craft at all serviceable, and since May last, small and large dirigibles have been humming, as if by enchantment over all our naval bases in company with *avions de chasse,* to the great delight of military men who see in this aerial activity a compensation for France's maritime decline.

Although it is contended in service papers that the largest rigid, the 65,000 cubic-mètre *Dixmude,* is being totally neglected, it is certain that at no time previously have so many French aeronauts been simultaneously in the air for the purpose of experiments and exercises, and—a fact deserving of notice in the light of the experience of rival fleets—no accident has up to the present marred that continuous aerial practice. The improved Zeppelin *Mediterranée* (25,000 cubic mètres) has to its credit several interesting performances, including one of 700 kilometres at a fine rate of speed (up to 150k.m. per hour), with on board Commandants Yvon and Rivet and ten officers *de vaisseau.* The Brest soft dirigible *AT 10,* in commission for coastal exercises, has kept the air days on end, advancing 200 miles to sea to meet the Salaun fleet, and directing by wire-

less the repeated submarine attacks which accounted theoretically for the Toulon Dreadnaughts.

Interesting tests have taken place with new bombing seaplanes and avions-torpilleurs that have once more convinced eye-witnesses that *l'air domine la mer,* and that the determining factor in European waters is no longer a supreme battle fleet, but a fully-efficient bombing seaplane fleet, screened by swarms of avions de combat, and backed by an adequate number of aeronautical and chemical factories and training centers—that is, a well-thought-out offensive organization capable of promptly making up for whatever losses are incurred and of periodically throwing into the air new squadrons, completely equipped for action over enemy strategic centers. It is easy to imagine the revolution in warfare which these new ways will mean. Formerly war was decided by one terrific blow dealt in fleet action, causing the issue to be a foregone conclusion. Henceforth no Trafalgar, no Lissa, Tsushima, or Jutland, but a wearing-out game, an unending fight, mostly baby-killing, extending over months, in which the advantage will go to the side offering the least vulnerable target. These changes were bound to come, but their advent has been hastened by the Washington farce. *Est pris qui croyais prendre.*—J. B. Goutreau in *Naval and Military Record,* 30 August, 1922.

SUBMARINE TRAINING.—Submarine training has been resumed on new lines. It comprises four branches of preparation, viz., attack and defense of a fleet at sea, endurance cruises, mine-laying, scouting, and wireless signalling in co-operation with seaplanes and dirigibles. Later, the utilization of the gunpower of submarines will be the objects of tests and exercises. The second-class submarines *Shilemans, Carissan, Reveillé, Bellone, Gergone,* and *Daphné* of the Channel Station, have had a few weeks' strenuous practice with the battle fleet, continuously attacking and dodging surface and aerial counter-submarines, and were commended for efficiency.

The *Toulon* and *Bizerta* submersibles in commission are, similarly, pursuing a methodical plan of training at sea. The ex-German *Marras* and *Autric*, of 850-1,150 tons, have successfully accomplished a 50-days' endurance voyage from Brest to Toulon viâ Casablanca, carrying out on the way a series of signalling exercises by day and by night and of depth charge and gun experiments in co-operation with the aerial force. Importance attaches to endurance tests of this sort, that are to become a regular feature in submarine training, with a view to insuring communications with the French colonies in war time. German submarines, though lacking in finish, are robust and reliable, and French seamen and constructors alike have learned something from them.—*Naval and Military Record,* 6 September, 1922.

MARINE CHARTS.—The sinking of the battleship *France* through the ripping open of the hull by uncharted rocks while she was proceeding slowly along the Teignouse passage into Quiberon Bay, has naturally brought the Hydrographic Department of the Marine under severe criticism. The explanation that the battleship must have struck some unknown rocks was at first received with scepticism, as it appeared almost impossible that such obstacles in home waters should have escaped detection. Divers, however, reported that the rocks existed, and that the top of one had been broken off by the impact. On behalf of the Hydrographic Department of the Marine it is explained that by the usual method of taking soundings it is quite possible to miss isolated rocks emerging from the sea bed, and it is stated that the only way to locate them is to draw a hawser along the bottom, which is to be done now that the disaster to the *France* has shown the necessity of verifying the charts of the particularly rocky coast of Brittany. The *France* was a super-Dreadnaught of

28,500 tons, launched in 1912, and, except for the *Béarn,* which is not yet in commission, was the most powerful unit in the French navy. A preliminary investigation by experts shows that the re-floating of the battleship will be a very expensive operation, even if it can be done successfully, and in the event of the vessel being regarded as a total loss it is believed that the Government has no intention of replacing it, although the question of bringing the tonnage of capital ships up to the limit allowed by the Washington Conference can only be settled when the new program of naval construction comes up for discussion.—*The Engineer,* 8 September, 1922.

BOOK REVIEW.—*The Conduct of War,* an interesting article in the August, *Revue Maritime,* is contributed by the well known Capitaine de frégate R. Castex, of the French naval general staff, on *La Conduite de la Guerre.* The author aims to show the importance and necessity of a central direction of naval operations in wartime, and to consider the effectiveness of the present arrangement in France whereby this central direction is vested in the Minister of Marine acting through a permanent naval general staff (*état major général*).

To show the necessity of this central direction or control—over the commanders in chief in the various fields of operation—he points out: (1) that naval forces nearly always operate in several widely separated fields; (2) that only on land and at the seat of government is it possible to gather together the knowledge and information essential to the general direction of all naval forces; (3) that the value of such control has been recognized in most naval campaigns of history, as witness the authority of the British Admiralty over Nelson, of the American "Strategy Board" over Sampson in the Spanish War, of the Japanese General Staff over Togo, and of the various navy departments over the forces at sea in the World War.

In short, an efficient system for the general direction of naval operations in war should fulfil the following conditions:

(1) Create and firmly organize a central direction of operations,

(2) Bring about a governmental organization which will enable this central direction freely and fully to carry out its important functions,

(3) Arrange and facilitate the relations between the central direction and the government.

Turning to the situation in France, the author notes that it is more difficult in a republic than in a monarchy to secure the proper relations between the government and the military direction. In a monarchy, such as Germany, the ruler is at least nominally head of the state, and the military staffs under him suffer less from unwarranted interference on the part of governmental leaders. For the control of military operations in France during the World War, various systems were tried. At first the commander-in-chief on the Western Front directed all operations; then with the creation of forces in the East and elsewhere and the problem of co-operation with Allied forces, the Ministry and in particular the Minister of War took over general control; then expert professional direction reasserted itself with the appointment of General Joffre as "technical counsel in the direction of the war" (1916); then came the appointment of Petain as Chief of General Staff in 1917, with more extensive advisory functions; and finally the appointment to this position of Foch, who eventually became commander-in-chief in reality.

In the French Navy, according to the author, a more satisfactory arrangement existed from the outset. In his view the ideal system would provide that the minister of marine should "command and administer the naval forces." This insures the direction of operations from the center of government, and the essential close co-operation between the government and the military direction, the *plan of operations* being recognized

as only a part of the *plan of the war.* The minister of marine's direction of naval operations, however, should be exercised through a general staff organized completely in time of peace to carry out its duties in time of war. In time of war, aside from necessary reinforcements, the personnel of the staff should remain unchanged, that is, until a change of leadership or policy were demanded.

The French system at present (Decrees of December 27, 1921) differs somewhat from this ideal. The admiral at the head of the general staff in peace becomes active commander-in-chief of forces at sea in time of war, his place on the general staff being taken by another. This modification the author is inclined to criticize, although it affects "only the summit of the edifice." In his opinion such a change, at such a time, might give rise to difficulties. His preference, to repeat, is for a system by which, in the army as in the navy, the minister is generalissimo or admiralissimo by legal right, and the chief of general staff is commander-in-chief in fact, with no change of personnel in passing from peace to war.

The article, of which what precedes is only a very brief summary, contains abundant historical illustrations, and is of great value in the study of this all-important problem.

JAPAN

TWO NEW CRUISERS TO BE BEGUN SHORTLY.—Tokio, Saturday.—The construction of two 7,500-ton cruisers will be begun shortly in Japan. The vessels will be named respectively the *Kinugasa* and the *Furutori.*—Reuter.—*Naval and Military Record,* 23 August, 1922.

AMERICAN BUILT UNIT FOR JAPANESE NAVY.—His Imperial Japanese Majesty's ship *Kamoi* left the yard of her builders, the New York Shipbuilding Corporation, for her trials at the Delaware River Breakwater on September 6. The ship, of 13,000 tons deadweight displacement and 28-ft. draft, is electrically driven, using General Electric motors and fitted with water tube boilers and is expected to make 15 knots. On her delivery she will be a supply ship for fuel oil and coal to naval vessels of the Japanese Navy and will carry a crew of 185.—*The Nautical Gazette,* 23 September, 1922.

JAPAN CUTS EXPENSES OF ITS ARMY AND NAVY.—Tokio, Sept. 12.—There appears to be a real intent on the part of Japan to retrench naval and military expenditures. The budgets for the two departments for the fiscal year 1923-24, made during the Washington conference, have been announced, showing a reduction of approximately $57,500,000 from the present fiscal year.

Other economies are slated by Premier Kato and it is believed that some will be carried out during the next year, but it will be the year 1924-25 before the real financial results of the Washington conference and of any subsequent reductions will be apparent in Japan.

The naval budget for the next year shows a reduction of $37,500,000. Ordinary expenses are listed at $60,000,000, a reduction of $7,500,000, and extraordinary expenses are listed at $99,000,000, a reduction of $30,000,000. In the army budget ordinary expenses are figured at $92,500,000, a reduction of $6,950,000, and the extraordinary figure is $16,500,000, a reduction of $12,950,000.

This means that instead of as in the past year, when forty-nine per cent of the national income went into the military coffers, only thirty-nine per cent of the national income will be devoted to the navy and army in the next fiscal year.—*Baltimore Evening Sun,* 12 September, 1922.

NEW JAPANESE PROGRAM EXPLAINED.—Japanese papers lately to hand contain more complete details of the modified naval program than were

given in the cabled summaries. A statement issued by the Navy Department reaffirms the intention of Japan not only to observe scrupulously the clauses of the Limitation Treaty as to battleships and aircraft carriers, but to conform also to the spirit of the Treaty with regard to the building of supplementary vessels. It is explained that the bill providing for a squadron of eight battleships and eight battle cruisers was approved by the Diet in the extraordinary session of 1920. This bill authorized the following auxiliary vessels for completion by 1927:

(a) Light Cruisers.—*Tatsuta, Tenryu,* and fifteen other vessels which had either been built or were already on order, making seventeen in all. New construction projected: Nine vessels, including four of 8,000 tons. Total, twenty-six ships, aggregating 146,750 tons.

(b) Destroyers.—*Kawakaze, Tanikaze, Nara, Kuwa,* and fifty-three other boats already built or ordered, making fifty-seven in all. New construction: First-class boats, twenty-eight; second-class, fifteen. Total, 100 boats, aggregating 102,566 tons. (Another version gives ninety-four as the total.)

(c) Submarines.—Vessels already built or ordered, forty-seven in all. New construction, forty-six. Total, ninety-three submarines, aggregating 82,852 tons.

It is then explained that in order to obtain greater homogeneity and more up-to-date design the various types of vessels not yet laid down are to be enlarged, while on the other hand a reduction is to be made in the number of new units and a further saving effected by the suppression of obsolete ships. As amended, therefore, the program of new construction now embraces the following:—

(a) Cruisers: four ships of about 10,000 tons and four of about 7,000 tons. Total, eight ships aggregating some 68,000 tons.

(b) Destroyers: twenty-four boats of the first class, aggregating 33,600 tons.

(c) Submarines: twenty-two boats (believed actually to be twenty-four, aggregating 28,600 tons.

With regard to expenditure, the statement points out that in the original plan there was a margin of only twenty per cent to meet the appreciation of prices, but in the modified scheme the percentage will be revised to make good the deficit. It is expected, therefore, that the new plan can be executed within the same financial limits. To this end the following vessels have been deleted from the original project: One cruiser, thirteen destroyers, and twenty-four submarines, representing an aggregate reduction of 13,399 tons—a reduction which, as the Navy Department emphasizes, sufficiently refutes the rumor that Japan contemplates an increase of her auxiliary ships in the post-Conference era. The scheme is to be completed by 1927, but the amount of new construction to be put in hand each year will be governed by the financial conditions prevailing, and in the meantime superannuated vessels will be struck off the list as they are replaced by new ships. When the exchange of ratifications of the Limitation Treaty has been concluded, other measures of retrenchment are to be adopted. These include the reduction of Maizuru from a naval base to a fleet station of secondary rank, the abandonment of Port Arthur as a secondary fleet station, and a decrease of about 12,000 in the strength of the Navy's personnel.—Hector C. Bywater in the *Naval and Military Record,* 23 August, 1922.

GERMANY

A GERMAN VIEW OF CRUISER DESIGN.—Concluding his interesting survey of modern light cruisers in the latest issue of the *Marine Rundschau,* Herr Ahnhudt, the distinguished German naval constructor, foreshadows the probable development of the type in the years ahead. Observing that British cruisers of the *C* and *D* classes are fitted with a small hangar for

aeroplanes, he considers it surprising that this feature has not been adopted for all cruisers in view of the great importance of aerial scouting. Each vessel of the American *Omaha* class is equipped to carry four aeroplanes on deck; the method of launching them has not yet been explained, but presumably it will be by catapult. Seeing that the British *Raleigh* cruisers were designed for long ocean cruises and patrolling wide areas of seas, it is remarkable that they are not provided with the means of carrying one or more planes, which would be of the utmost value to such ships in their duty of protecting commerce. As Herr Ahnhudt points out, however, to have an aeroplane always ready for flight it is not sufficient to carry it on the open deck, where it would hinder the working of the guns, and consequently a fixed hangar must be constructed for it. With regard to the evolution of the fleet cruiser, as distinct from types specially designed for service overseas, Herr Ahnhudt does not think the displacement ought to exceed 4,000 tons, and he would be prepared to give up armor protection in order to get high speed and adequate armament. Britain, he reminds us, moved in this direction as far back as 1907, when she built the *Swift,* an unprotected vessel of 2,200 tons, 35 knots speed, and four 4-in. guns. Owing to the high cost, however, this type was not repeated.

More lately Britain has been turning out flotilla leaders of 1,800 tons, with a trial speed of 36½ knots, reduced to 31 knots at full load, and a broadside of five 4.7-in. guns and six tubes. These ships may represent the beginning of a new type of small fleet cruiser. Italy is building similar vessels, and the 2,300-ton "destroyers" constructed in Germany during the war belonged to the same general type. It would therefore appear, according to Herr Ahnhudt, that the largest class of destroyers may eventually grow into flotilla leaders, while the fleet cruiser proper is becoming too large for its original duty of co-operating with destroyers, and thus losing its *raison d'etre.* In the case of cruisers intended for duty overseas, large dimensions are an advantage, for which reason these vessels would probably grow steadily in size were it not for the heavy cost of construction. The *C* class cost £750,000 each, the *D* class £870,000, the *Raleigh* £1,500,000, and the U. S. *Omaha* 7½ million dollars without her guns. Therefore, notwithstanding the cry of every Navy for more cruisers, the number of these expensive vessels is likely to remain small, though every effort will be made to improve their protection. A further rise in displacement will bring us back to the medium armored cruiser, which a few years ago was thought to be extinct. As, however, the task of hunting down commerce-raiders necessitates the employment of many ships, and individual strength cannot compensate for lack of numbers, Herr Ahnhudt foresees the introduction of a new type of small ocean-going cruiser. His remarks have a special interest for this country, since the safety of its vast floating commerce must always be our chief naval preoccupation, and such protection can only be afforded by an adequate fleet of cruising ships.—*Naval and Military Record,* 23 August, 1922.

GERMAN WATERS NOW CLEARED OF MINES.—Berlin, Sept. 26.—The work of clearing the German seas of dangerous mines, planted during the World War, has been successfully completed without the loss of a single life.

German mariners, ending their three and a half-year task, today announced that the 47,000 English mines, the 10,000 German mines and the hundreds of Russian mines planted in the North and Baltic seas have been taken from their watery beds and that the seas are free again.

In February, 1919, German sailors began their hazardous work. Their first effort was to clear a lane wherein ships from Northern European ports, Kiel, Hamburg and Dantzig, could safely ply.—*Baltimore Evening Sun,* 26 September, 1922.

UNITED STATES

BOARD TO APPRAISE SHORE ESTABLISHMENT OF THE NAVY: The board recently appointed by Secretary Denby and which will meet on October 2, is acting under the following precept.—"The Board will recommend the bases, yards and stations it considers necessary to the maintenance of the efficiency of the fleet and its effective operation in peace and war. It will report specifically its recommendations as to:

(a) The shore stations and parcels of improved and unimproved real-estate now in the custody of the Navy Department which it considers will not either in peace or war contribute to the maintenance of the efficiency of the fleet or to its effective operation.

(b) The shore stations that under present conditions it considers should be kept in operation for the efficient maintenance and effective operation of the fleet.

(c) The shore stations that should be retained but kept closed or on a reduced operating basis yet ready for service in the event of an emergency.

(d) Shore stations in addition to those recommended under (b) and (c) above that are in the opinion of the board necessary for the effective operation of the fleet in peace and war including recommendations as to their location and characteristics.

(e) Shore stations that may be closed, reduced or disposed of when the shore stations recommended under (d) have been created."

TORPEDO PLANE TESTS.—The possibilities of the torpedo plane have been well known for several years but the first practical test of actual torpedo firing from airplanes was held on the Southern Drill Grounds on Wednesday, September 27. Eighteen planes, each equipped with one 18-inch Whitehead torpedo, comprised the attacking force, which was assisted by a dozen or more scouting planes and one blimp. The battleships *Wyoming, Arkansas* and *North Dakota,* steaming in line, comprised the target group.

The practice was held to test the equipment which has thus far been developed, and to furnish a basis for the development of torpedo plane tactics. The conditions imposed by the rules preclude the drawing of any reliable conclusions as to the value of the torpedo plane as a weapon. The tests mark another step in the practical development of aerial warfare.

Vice Admiral John D. McDonald, commanding the battleship force, Atlantic Fleet, sent the following despatch to the Department upon completion of the practice:

"Torpedo plane practice completed at 11.17 a.m. under most favorable conditions of weather and sea. Zero hour 9.00 a.m. Dirigible observed at 9.35 a.m. keeping low over battleships during the practice. Scout planes observed 9.55 also keeping in vicinity of battleships. At 10.18 sighted torpedo plane squadron and maneuvered at high speed to keep planes astern. Plane squadron divided and attacked from both flanks, battleships maneuvering to keep planes ahead and astern. *Arkansas* sustained seven hits out of seventeen torpedoes fired, all fired close aboard."

The Associated Press correspondent, who witnessed the tests from the bridge of the *Wyoming,* described the practice as follows:

"Under most favorable conditions that gave attacking force practically ninety per cent advantage, three squadrons of torpedo planes today fired seventeen torpedoes at battleship *Arkansas* and scored seven hits, theoretically sinking that ship. The test was held under the most favorable weather conditions, the planes coming within a few hundred yards of the battleships and discharging their torpedoes at will, the dreadnaughts depending only upon the skill of their officers and their rudders to evade

theoretical destruction.. The planes in leisurely fashion attacked the target ship *Arkansas,* while the fleet was steaming at high speed. When the planes were sighted the battleships maneuvered to keep them ahead and astern and avoided a number of hits fired point blank at battleships."

The torpedo planes used in these tests were old planes converted for the purpose, yet they held up very well. All but one fired their torpedoes—the one failure being due to trouble with the releasing mechanism. Three of the planes had forced landings on their return trip, but the Air Station at Hampton Roads reported them all safe.

THE NAVY'S AIRCRAFT CARRIERS LEXINGTON AND SARATOGA.—Under the provisions of the Act of Congress which provided for the conversion of two battle cruisers into aircraft carriers, work has been resumed on the hulls of the U. S. S. *Lexington* (*Fore River*) and U. S. S. *Saratoga* (*Camden*). Final plans have not been approved by the Department but they have been practically completed by the Bureau of Construction and Repair.

As battle cruisers these vessels had a designed displacement of 43,500 tons and a speed of 33.25 knots, with length 874 feet, beam 101 feet 8¼ inches and mean draft 31 feet. The powerplant which will remain unchanged, will develop 180,000 H.P. through 16 boilers and General Electric turbines with electric drive.

While the Department is not yet ready to announce the details of their plans for the *Lexington* and *Saratoga,* Articles IX and X of the Limitation Treaty limit the tonnage to a maximum of 33,000 tons, and limit the armament to not more than eight guns of a caliber larger than six-inch while the maximum size of guns permitted is 8 inch.

U. S. S. *Langley*

The U. S. S. *Langley* is now on her shakedown cruise preparatory to taking her place in the fleet as the Navy's first airplane carrier. The new *Langley* was originally built at Mare Island as the collier *Jupiter*—famous as the first large ship in the world to have electric drive—and launched in 1912. The work of conversion was done at the Norfolk Yard.

The flying-off deck of the *Langley* is 520 feet long and 65 feet wide. Telescopic masts 50 feet high are housed like periscopes when not up in position. The ship is a combined floating aviation field hangar and repair plant for aeroplanes. The repair plant includes an armory, carpenter and wing repair shops, machine shop, blacksmith shop and foundry, metal shop and torpedo repair shop, besides photographic and aerological laboratories. There is an electric elevator for lifting fuselages and wings from the main deck to the flying-off deck. When lowered the top of the elevator forms a part of the flying-off deck. There are two electric traveling cranes on the main deck for shifting planes fore and aft, and there are four cranes on the topside for hoisting planes from the water to the flying-off deck. The navigating bridge is below the flying-off deck, and there are "T-booms" along the ship's sides for the auxiliary radio antennas. There are two catapults on deck, one forward and one aft—there is a testing room and stand for aeroplane engines, a pigeon loft, a kite balloon filling station, and all the features which make a large modern naval vessel, vertually a floating city. The ship has been converted from a coal burner to an oil-burner, and her armament is four 5-inch guns. The ship is fitted to accommodate ten ship's officers, thirty-five commissioned and warrant aviators, thirty-one chief petty officers, and 229 men for the crew.

The U. S. S. *Wright*

The U. S. S. *Wright,* at present flagship of the Air Force Atlantic Fleet, is a seaplane tender and kite balloon ship. The *Wright* was built at Hog Island and was one of the Shipping Board's type *B* ships. She

was converted by Tietjen and Lang, Hoboken, N. J. Her dimensions are length 448 feet, beam 58 feet, mean draft 31 feet, displacement 14,240 tons. Her speed is 15 knots, furnished by six B and W oil-burning boilers and General Electric geared turbines of 6,000 horsepower. Her armament consists of four 5-inch guns, and she has accommodations for her captain, aviation detachment commander, twenty-eight wardroom officers, twenty junior officers, twelve warrant officers, sixty chief petty officers and a crew of 450 men.

BRITISH AND UNITED STATES NAVAL AIR SERVICES.—In commenting on the deficiencies of our naval air service, several writers have pointed with envy to the more advantageous position of the United States fleet, which has entire control over its aviation branch and is apparently well supplied with pilots and machines. It is, however, rather doubtful whether American naval flying is in quite so prosperous a condition as the superficial facts indicate. Although the present establishment of machines is larger than ours, complaints are heard of a shortage of up-to-date models in certain types, and it is also said that the paper strength includes many planes which for one reason or another—deterioration or obsolete design—are practically useless. Where the American naval air wing appears to lead is in respect of fighting machines and torpedo planes, types to the improvement of which special attention has been devoted. Several planes now in commission are capable of carrying a 21-in. torpedo at a speed and altitude that would be fully equal to war requirements. The latest combat machines are also of a most efficient type. For the time being, however, the development of naval flying is sorely handicapped by the lack of aircraft carriers. The ex-collier *Langley* is the only vessel of this type at present available, and her speed is much too low to permit of her co-operating with the fleet under all conditions. For this reason American naval men are anxious that the two battle cruisers selected for conversion into carriers shall be completed with all speed, but if Congress persists in its parsimonious attitude and continues to dole out money at the present rate it will be three or even four years before the ships are ready.—*Naval and Military Record,* 23 August, 1922.

TEAPOT DOME OIL DEAL SOUND.—One of the sensational "issues" in the 1922 political campaign will be the contract negotiated by Secretary of the Interior Albert B. Fall, acting for the Navy Department, for the development of Naval Reserve, No. 3, Teapot Dome, Wyoming, by the Mammoth Oil Company, a Delaware corporation, of which Harry F. Sinclair is the head. It is the evident intention of the Democratic orators who are attacking this contract, to read into the situation another Ballinger-Pinchot affair, and thus, at the start, to create a prejudice against the contract, which will operate conveniently in place of fact. If this is the purpose, it might be well for the promoters of any campaign of misrepresentation to pause and recall that subsequent investigations, both by Congress and by secretaries of the interior of a different political faith, have disclosed that the course of Mr. Ballinger was wholly proper and one that any other sound business man would have pursued, who was as familiar as Mr. Ballinger with the circumstances. But prejudice is an adroit and dangerous political weapon, and it was with some little prejudice in favor of the criticisms that your correspondent entered upon a personal investigation of the circumstances of Teapot Dome and the Sinclair contract. As a result, he is able to set forth certain facts which the critics have either distorted or suppressed.

It is a matter of familiar history that owing to failure to drill suitable offset wells in Naval Reserves Nos. 1 and 2, California, the Government has suffered a loss of 6,800,000 barrels of royalty oil through drainage. Teapot Dome lies south of and adjoins the great Salt Creek oil field in

Wyoming, and exactly the same loss from drainage was threatened by private operations in the Salt Creek field to the north when the Harding Administration determined that naval reserve oil history should not be repeated. To this end Secretary Fall cast about to secure a development of Teapot Dome which should end the danger and secure to the Navy an adequate supply of oil, both for the present and for future use. It was, of course, argued with respect to the California fields that the Government would suffer no loss if the situation were let alone, but men like Mark L. Requa and Franklin K. Lane urged that the Navy should protect its reserves by drilling wells, and the sequel proved that their advice was more than justified. According to Dr. H. Foster Bain, director of the Bureau of Mines, "delay in properly protecting the boundaries of the reserves (Nos. 1 and 2, California) against drainage by wells on adjoining lands has resulted in a loss of ultimate total production from the reserves as a whole, as most conservatively estimated, as follows: Total production, 22,000,000 barrels; Government royalty, 6,800,000 barrels; value of royalty, $8,800,000."

Teapot Dome is supposed to contain, at approximately the same depth, the same oil-bearing sands developed in the main Salt Creek structure. For this and other reasons, according to Government experts who have studied Naval Reserve No. 3, the same presumption of loss through drainage exists as with reference to the California reserves. It is to be borne in mind, moreover, that another dangerous factor is the loss of gas pressure, the propulsive power of the oil, which loss leaves the oil inert and incapable of coming to the surface except through expensive pumping or artificial air pressure. As Secretary Fall has said: "The undeniable facts, insofar as human judgment can ascertain them from expert evidence and otherwise, are that at least a certain portion of the north part of Naval Reserve No 3, the Teapot Dome, is now, or will be, disastrously affected through drainage by the drilling upon the lands outside the naval reserve, which drilling is now being carried on from day to day. Such drillings upon such lands is in accordance with the terms of the law itself (law of February 25, 1920), and those conducting such operations are protected by the law."—*Boston Evening Transcript*, 9 September, 1922.

MERCHANT MARINE

UNITED STATES SHIPPING POLICY.—When the Great War came to an end and the German Fleet had virtually disappeared it was popularly supposed in this country that the era of naval competition was past and that the British flag would henceforth wave in uncontested supremacy over the seven seas. This, of course, was a delusion, as we soon discovered. While Europe was preoccupied with her war troubles, great naval projects had been maturing in America and the Far East, and a rivalry which had as its original object the mastery of the Pacific now threatened to alter the world-wide balance of naval power much to our disadvantage. In 1919, both the United States and Japan were at work on huge shipbuilding programs, while the dockyards of Europe were comparatively idle. Had the American scheme been carried out in full it would ultimately have placed the United States in possession of the strongest fleet in the world. Such a prospect could not be viewed with equanimity on this side of the Atlantic. Anxious as we were to maintain those cordial relations with our American cousins which common suffering and sacrifice had fostered during the war, it was realized only too clearly that to accept a subordinate rank in the naval hierarchy would be fatal alike to the prestige, the interests, and, ultimately, to the existence of the British Empire. On the other hand, the thought of entering into a naval competition with the United States was wholly repugnant to our people, irrespective of the tremendous financial strain it would involve. In these circumstances the proposal of President Harding to discuss the question of future naval strength

at a Conference of the Powers chiefly concerned was warmly welcomed here, and it can safely be said that no nation tried harder than Great Britain to make the Washington meeting a success. That it was on the whole a distinct success, especially as regards the limitation of naval armaments, is admitted everywhere save in France, where the Conference is still referred to as a "maneuver" and a "farce." If those terms are justified, we can only say that it is a pity the diplomatists of Europe have not staged a few maneuvers and farces of the same description.

With the signing of the Limitation Treaty all danger of a battleship competition between ourselves and America has been removed. That alone is a most gratifying achievement, a triumph of statesmanship without parallel in modern history. But although the United States has abandoned the ambition it seemed to entertain during the war of becoming the dominant naval Power, it has by no means given up the plan, conceived at the same time, of building up a great mercantile fleet and having the major proportion of its seaborne trade carried in American bottoms. On the contrary, strenuous efforts are being made to realize this aim by legislative and other methods designed to buttress American shipping against foreign competition. In pursuing this policy the United States is acting well within its rights, and, although the wisdom of certain measures which it has taken may be open to question, outside criticism is called for only if and when those measures prove unduly detrimental to the legitimate interests of other countries. The conclusion reached by the directors of American policy is that high wages and heavier running costs impose such a handicap on their shipowners that without preferential treatment of a very definite kind there is no hope of maintaining the national merchant navy on a profitable basis. Hence, the various legislative measures which have been introduced recently, including the Ship Subsidy Bill, and the vigorous propaganda carried on by the U. S. Shipping Board to arouse popular enthusiasm for the Government's plans.

In British shipping circles the conviction still prevails that if America's mercantile marine needs all these artificial aids to keep it alive, its existence will not be of long duration, for sooner or later the American people will grow weary of paying heavy subsidies to an industry that cannot support itself. From the British point of view, the most unfortunate feature of American shipping policy is the somewhat aggressive attitude displayed by those who control it. The exceptionally able correspondent of *The Morning Post* in Washington, credits Mr. Lasker, who is chairman of the Shipping Board, with believing that the easiest way to rehabilitate the American merchant marine is to antagonize British shipping interests wherever possible, and use the power of his Government in a way which would not be sanctioned by private interests competing for trade. It is further suggested that some connection may exist between this policy and incidents such as that at Newcastle-on-Tyne, where the American Consular officials were charged with having abused their position in order to obtain business for vessels of the U. S. Shipping Board. This case was deemed sufficiently flagrant by the British Government to justify the withdrawal of the exequaturs of the officials concerned. One can only hope that the good sense of the Americans will soon convince them of the futility of attempting to bolster up their shipping interests by such methods. The Yellow Press talks wildly of the propaganda which British shipowners are alleged to be conducting against the growth and development of the American merchant marine, but Sir Frederick Lewis, the president of the Chamber of Shipping, has made it clear that there is not one word of truth in this allegation. He ventured to remark, however, apropos to recent shipping legislation in the States, that "restrictions on freedom in commerce are surely retrograde movements, and not progressive." That is certainly the general opinion on this side of the Atlantic, and we shall be surprised if it does not eventually find acceptance on the other side as well.—*Naval and Military Record,* 13 September, 1922.

LIBELING OF SHIPS UNAVOIDABLE.—The Shipping Board's action in libeling the vessels of the Atlantic Gulf and Pacific Company has excited much comment in shipping circles this week. It is an indication of the Board's policy in regard to the speculative pioneer purchasers of Government tonnage, and similar procedure is expected to be followed in connection with other companies in like circumstances.

In an article appearing in the August 12 issue of *The Nautical Gazette* it was pointed out that the policy of selling the notes made by pioneer purchasers in favor of the Board to cover the unpaid portion of the price of their ships, was an unwise one. It was contended that the Government should either demand the payment of these notes in full or regain possession of the ships. Since that time the Shipping Board, by its action in libeling the Atlantic Gulf and Pacific Company's vessels, has given unmistakable evidence of the course it intends to pursue in these matters.

The story of the Board's dealing with this company is a long chapter of patient waiting for the fulfillment of promises. It is the first time that the transactions with any one of the pioneer purchasers have been made public, and the revelation is a justification of the Board's treatment of this concern.

Because of its desire to have its existing services continued uninterruptedly and to develop owning operators of American ships the Board has granted extraordinary indulgence to the Atlantic Gulf and Pacific Company and other pioneer purchasers. When the present Board assumed office over a year ago it was found that the Atlantic Gulf and Pacific Company had obtained from the previous Board six ships for which it agreed to pay $9,314,137 and of which amount only $195,000 had been paid. Under this contract six ships, of a total of 54,000 tons, which were the very cream of the Board's fleet were delivered to this company with a down payment of two and a half per cent of the purchase price. This constituted delivery of these ships at a little over three dollars per ton, and no cargo ships have been delivered to any one else on a comparable low basis of down payment.

Since the present Board has been in office the company has not paid one cent of principal nor one cent of interest, so that by the payment of $195,000 and nothing else the company has remained in possession and operation of ships, which if marked down to present day values, would be worth approximately $2,000,000.

The Shipping Board had been constantly hoping that with this and other so-called "pioneer ship purchasers" who owe large sums on their ships some arrangement could be worked out whereby the Government would obtain at least current market prices for its property, and negotiations have been carried on continuously with the various companies to this end, the Shipping Board tendering ultra-liberal settlements. In no case has the Board asked its delinquent ship purchase debtors who were financially involved to pay it anything like the face of existing obligations.

These negotiations have dragged along, some companies settling on this basis; some few have not, but none of the companies that have not settled have paid the Board anything in the way of interest or principal. The Board has not pressed its debtors threateningly during this period, because its object has been to accomplish settlement and it wished to do nothing to embarrass its debtors from raising moneys.

Finally the Board was forced to conclude that those who had not settled were in fact drifting along without paying interest or principal to such an extent that a time limit had to be arrived at; many of these companies, the Board learned, not only could not raise the moneys to pay for their ships, but would be unable to remain financially sound for purposes of operation, and thus the Government's ships would be laid open to libel.

When the Board, after unremitting patience and sympathetic indulgence, reluctantly came to this conclusion, it determined that between Septem-

ber 1 and 15, either the amounts owing it must be liquidated on an agreed liberal settlement basis by its debtors, or the Board would have to proceed to bring about the return of its ships.

In the case of the Atlantic Gulf and Pacific Company the Board was forced to take action when it did, because it learned that if it gave the company indulgence until the deadline time, the ships most likely would be libeled by outside maritime creditors.—*The Nautical Gazette*, 2 September, 1922.

SUBSIDIES FOR SHIPOWNERS OR SHIPBUILDERS.—The inability of the war afflicted countries of Europe to exchange goods with their neighbors or nations overseas on the same scale as before hostilities began, has caused a great shrinkage of international trade, with the result that a large proportion of the world's merchant fleet is idle for lack of cargoes. The chief sufferers from this state of affairs have been the shipping and shipbuilding industries which are depressed to an extent probably never before witnessed. This has led the shipping interests in most of the leading maritime states to ask for some form of Government aid to tide them over until normal trade conditions return. In the United States subsidies to shipowners is the projected measure of relief, while in Italy, Japan and elsewhere the policy of granting subventions to shipbuilders seems to be most in favor.

The drawback to our Federal administration's plan of indiscriminate subsidies to all American shipowners irrespective of the modernness or obsoleteness of their vessel fleets is that it would accomplish nothing for the advancement of our merchant marine. It encourages the retention in service of the vessels now afloat without regard to their age or efficiency and offers no premium for the replacement of existing units by up-to-date ships. In the opinion of many competent observers, as revolutionary a change is impending from steamships to oil-driven motorships, as took place around the middle of the last century, when sailing vessels were superseded by steamers. Instead of encouraging this change in the case of our own merchant marine, the administration's ship subsidy bill would have a directly opposite effect, for it treats all American flag ships on the same footing, whether they are obsolete wooden craft or modern internal-combustion engined freighters.

By way of contrast the experts appointed by the Japanese Government to consider the best means of rehabilitating the nation's ocean services and meeting the threatened competition of American subsidized ships have recommended the building of a number of new fast Japanese merchantmen aggregating 500,000 tons, whose construction is to be made possible by a series of Government loans bearing a low rate of interest. This would lead to a revival of Japan's shipbuilding industry, and give the Mikado's realm the most modern and most efficient passenger and freight carriers. The Italian Minister of Marine is also of the opinion that any Government money devoted to the furtherance of his country's merchant marine should be expended on the construction of new ships, which would have the advantage of relieving unemployment and of supplying Italy with an adequate merchant fleet when trade returns to normalcy.

In giving subventions to shipbuilders, instead of shipowners as proposed in this country, Japan and Italy would have as a result of their expenditures a number of modern liners and cargo carriers of the most efficient type. But as Signor Luigi Ernandi pointed out in a recent article, the future cannot be gauged with certainty. In a time of depression like the present, it is impossible to foresee the kind of vessel that will be most required when trade again attains its normal volume. In building vessels by guesswork instead of in response to an actual demand, one runs the risk of turning out merchantmen not desired by anyone and which may have to be sold at a heavy loss if they can be marketed at all. Despite

the force of this objection, Government aid to shipbuilders would result in something tangible towards the upbuilding of a merchant marine, which is more than can be said of most subsidies to shipowners.—*The Nautical Gazette,* 9 September, 1922.

BOARD DISPOSES OF ITS WOODEN SHIPS.—On a bid of $750,000 from George D. Perry, a lawyer of San Francisco, the Shipping Board has disposed of 226 wooden ships which comprise the greater part of its entire wooden fleet of 285 vessels which cost approximately $300,000,000. A few of the wooden ships still remain in the hands of the Board but with this sale the fleet has been practically disposed of. There were ten bidders at the sale, many of whom had come prepared to bid upon the fleet in lots rather than as a whole, but Sidney Henry, director of sales for the Emergency Fleet Corporation, stated that the Board would offer for sale the whole number of ships as a unit. The bid of $750,000 represents a little more than $3,318 a vessel which is considerably in excess of the bid of $2,100 a ship which was made some time ago and rejected by the Board.

Under the contract of sale the vessels will not be used for transportation purposes but will be promptly dismantled. Two hundred and seventeen of the vessels are of wooden construction, the other nine being composite wood and steel. Two hundred and eleven of the vessels are located at Claremont, Va., thirteen are in Orange, Tex., and two at Beaumont, Tex.—*The Nautical Gazette,* 16 September, 1922.

ENGINEERING

JAPANESE FUEL SUPPLY SHIP HAS MANY NEW FEATURES.—The *Kamoi,* a 20,000 ton, 8,000 H.P. twin-screw fuel supply ship for service with the Japanese Navy, and the first vessel of any navy other than the United States to be electrically propelled, successfully completed the builders' trials off the Delaware Capes last week. For thirty-six hours the *Kamoi* was put through tests that brought into play every possible stress on all parts of her machinery and equipment and showed no signs of weakness.

The electric drive equipment of the *Kamoi* designed and installed by the General Electric Company, includes the use of synchronous motors for the first time in any twin-screw vessel. Tests demonstrated that the Japanese ship is the most economically operated steam vessel of her size afloat. Her electrical propulsion machinery gives unusual flexibility of control as well as economy of operation, and the mechanical simplicity of the driving unit affords exceptional reliability.

There is practically no vibration to the vessel as was shown by the balancing of a nickel on edge on the foundation of the main turbine while the ship was under way. While the ship was going ahead at full speed the propelling machinery was reversed to one-quarter astern in nineteen seconds, after which the engines were brought up to full speed astern.

The main propulsion unit consists of an 8,000 horsepower Curtis turbine generator, supplying power to two 4,000 horsepower synchronous motors directly driving the twin-screw propellers. There are also two 400-kilowatt direct current turbine generators which supply the excitation current as well as power to operate the auxiliaries such as the main circulation pump, main condensate pump, sanitary pump, blower motors, steering gear, radio apparatus, ventilators and lighting equipment.

There is also a 625 kilowatt auxiliary alternator which can be connected to either of the auxiliary turbines in case of the failure of the main driving unit or any of the auxiliaries. This small generator will supply sufficient power to propel the ship at a speed of about seven knots.

The vessel is a coal burner, equipped with four Yarrow type boilers which have oil spray boosters attached to be used when high temperature is desired quickly.

The radio equipment is also of General Electric manufacture, consisting of a one-kilowatt telephone and telegraph transmitter and two complete receiving sets, one with a range of 250 to 3,000 meters and the other from 250 to 30,000 meters. An unusual feature of the telephone installation is five extensions from the radio room connecting with the captain's cabin, engine room and other parts of the ship. By means of this equipment the captain can remove the receiver from the phone at any one of five stations and put in a call for the officer of another ship and carry on a conversation by radio much as he might from an office on a land telephone.

The ship has a normal tonnage of 19,500, is 495 feet long and has a beam of 62 feet. It has a draught of 28 feet and a deadweight displacement of 13,000 tons. It is equipped to carry approximately 10,000 tons of fuel oil.—*The Nautical Gazette,* 16 September, 1922.

AN ELECTRO-MAGNETIC INSPECTION LAMP.—A portable electric lamp, which will be found a great convenience for inspecting machinery in darkened parts of the factory or workshop, is the Kendrick electromagnetic inspection lamp. It consists of a lampholder (complete with wire guard, bulb, and length of flexible) mounted on an electric-magnetic base, which adheres strongly to any iron or steel surface, leaving the operative's hands free, preventing the possibility of breakage, and ensuring efficient illumination of the work to be carried out without obstructing the worker. The makers (The Neale Magnet Construction Co., of 7, Suffolk St., Pall Mall East, S. W. 1.) also make a high-voltage lamp for any circuit between 100-250 volts, for factories and industrial establishments, and a further model, approved by the Home Office, with special insulating and earthing arrangements to comply with the Factory Acts. A special type is supplied for motor-car inspection, which may be used in conjunction with the ordinary lighting set.—*Engineering and Industrial Management,* 7 September, 1922.

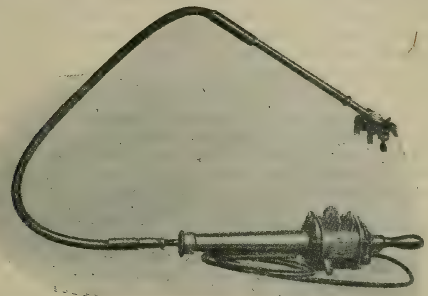
THE PENFLEX RIVET "GUN."—The Penflex rivet "gun" of the Pennsylvania Flexible Metallic Tubing Company, Philadelphia, in use at the yard of the New York Shipbuilding Company, is illustrated in the *Iron Age,* for August 17. The "gun" and the forge are conveniently located at a distance, tubing leading to the job. As each rivet is heated and ready to be passed, it is set on a valve provided in an opening contained in the head of the "gun." The rivet opens the valve by its own weight and enters the machine. The valve closes then automatically and the rivet is sent on its journey simply by pressing a foot treadle, this placing the "gun" in communication with a compressed air receiver. The rivet "gun" has a distance capacity of 125 ft., delivering rivets up or down at the rate of 50 ft. every three seconds. It is claimed that the "gun" has exceeded this performance, shooting rivets 180 ft. in nine and a fraction seconds without subjecting the rivets to change of temperature. One of its outstanding advantages is that it eliminates the necessity of placing rivet forges in close compartments near the riveting work in hand.—*Engineering,* 1 September, 1922.

PNEUMATIC TOOL FOR REMOVING RUST AND SCALE.—A pneumatic tool for breaking light scale from boilers and removing rust and old paint from constructional ironworks and ships' bottoms is being placed on the market by Sir W. G. Armstrong, Whitworth & Company, Limited. The action of the piston is so very rapid and the blow is so light that all risk of damage to the surface operated upon is obviated while the work is accomplished in a fraction of the time required when hand hammers are used.

On account of its small size and weight of only 4.75 lbs., the machine can be operated by boys without any difficulties. Its length over all is 23.5 inches and approximate consumption of air at 95 lbs., only five cubic feet.

It can deliver 9,000 blows per minute.—*The Nautical Gazette,* 23 September, 1922.

AN ELECTRIC SCALING HAMMER.—Demonstrations have recently been given in this country of the Sandblom electric scaling hammer, which has been devised by a Swedish inventor and has had considerable application in Scandinavia. This tool, which is illustrated below, consists of a spindle making about 1,200 revolutions per minute and equipped with a number of short chains with small hammer-heads at their free ends. The number of these chains varies from eight to two, according to the class of work to be done. The driving power is supplied by a small electric motor of very light weight, and so adapted that it may be conveniently



SANDBLOM ELECTRIC SCALING MOTOR, FLEXIBLE SHAFT AND HAMMER-HEAD

held by the workman. When the motor is started the chains are thrown outwards by centrifugal force. The revolving spindle with its hammers is then held parallel to the work, so that the hammer-heads come into contact with the surface to be scaled, striking the surface at the rate of about 10,000 blows per minute. It is claimed for the apparatus that it provides the most rapid and efficient means yet devised of removing scale, rust and paint from iron and steel work, and, moreover, leaves a smooth and even surface, without the cuts and indentations in the plate associated with the use of hand and pneumatic chipping tools.

Actual test made at a floating dock in Copenhagen demonstrated that the Sandblom hammer did the work of from ten to twenty-five men with hand hammers, and worked at about three and a half times the rate of pneumatic scalers.—*The Shipbuilder,* August, 1922.

AERONAUTICS

THE YEAR'S PROGRESS IN AIRCRAFT.—What Jane and Brassey have done for the naval world, the *Aircraft Year Book* of the Aeronautical Chamber of Commerce of America promises to do in the broad field of aeronautics. Although the aircraft annual is but a few years old, it has grown so rapidly, and is edited with such care and comprehension, that it is distinctly comparable in scope and quality to the long-established naval annuals above referred to. Within its 250 pages will be found an answer to every question which a yearbook may legitimately be expected to answer.

The book opens with a review of commercial aviation during the year, in which the fact is brought out that aircraft have continued to demonstrate

their utility equally in the fields of commercial transportation and of military service. Chapter two deals with the problems of aerial transportation, such as the need for capital for proper terminals, landing fields, etc., and the urgent call for thorough reliability.

So important were the bombing tests carried out a year ago, off the Virginia Coast, that a considerable part of the third chapter is given up to a discussion of these tests. Each series is taken up in its turn; and it is needless to say that this digest forms in itself a very thrilling story, ending with the sinking of the battleship *Ostfriesland* by bombs of 200-pounds weight.

One of the most valuable chapters of the book is that devoted to a review of aeronautics throughout the world, nation by nation; for here we have brought together a mass of information which only the facilities of such a body as the Aeronautical Chamber of Commerce render possible of collection. The fifth chapter on technical progress in aircraft construction during the year will be read with close attention by every aeronautical student. The subject is treated under the head of Army Airplanes, Naval Aircraft, Mail Airplanes, Commercial Airplanes, Racing Machines, Airships, and Aeronautical Engines. As a result of recent development, the Army Air Service possesses a two-seater, Dayton-Wright, night observation biplane, with a 300-horsepower engine, which has a performance superior to that of the *DH-4B,* fitted with the 400-horsepower Liberty engine. Another type developed for the Army is the *GAX* Ground Attack Triplane, which carries a 37-millimeter quick-firing gun, and eight machine guns. The *Martin* bomber, with its two 400-horsepower Liberty engines, has been improved, and is considered now to be one of the best military machines of its class in existence. Other machines are two semi-cantilever monoplanes, a long-range day bomber, fitted with the McCook Field 700-horsepower engine; the *Loening* pursuit biplane, fitted with a Wright 400-horsepower radial engine, and the *Barling* bomber, carrying six Liberty engines. Among naval aircraft there have been developed the *Curtiss* torpedo dropper—a notable departure in seaplane construction. Great promise is also shown by the Douglass torpedo dropper.

A notable feature of this annual is the number and character of the illustrations, which are well-chosen for their purpose of showing the various types of machine, and particularly those which have won for the United States various records for height and speed. These include some excellent photographs of the airship bombing test, and views of various useful services, such as forest fire partol, in which the airplanes has found a field of usefulness.

The Historical Design Section, which constitutes the second half of the volume, is packed with information. It opens with a complete series of line drawings, including plan, front and side elevation of the various types of American aircraft. These are followed by pen-and-ink drawings of the standard types of motor; and the work closes with a statement of aircraft appropriations by the United States Government, aircraft production costs, the activities of the Mail Service, and of the Forest Fire Patrol. Finally there is a very complete chronology of aircraft happenings for the year 1921.—*Scientific American,* October, 1922.

THE LOGIC OF A SEPARATE AIR FORCE.—Among older officers of the army and navy, advocates of a separate air service have encountered very general opposition to their views based largely on tactical doctrines. These officers point out that unity of command is essential to success in war, and no one can question the truth of this; evils of divided leadership have indeed passed into a proverb. These officers assert further that true unity of command—good team work, in other words—cannot be secured in war unless habitually practiced in peace; nor can anyone object to this dictum. From these major premises, they proceed with the further assumption that in

time of battle, the air service must strictly conform to the work of the ground or sea forces, and from this logically deduce that the air service must be in war and in peace a component part of the army and navy. In the latter assumption lies the error.

OBSERVATION VS. AIR WARFARE

It is human to formulate general principles from one's own experiences, no matter how limited they may be. The average army or navy officer in the World War, if he had any contact at all with the Air Service, show nothing but the work of observation aviation. The number of officers of rank who had occasion to learn of the work of the air force—pursuit, bombardment, and attack aviation—is so small as to be negligible. Naval officers had practically no experience of air warfare except patrol. It is then, quite natural that officers of rank, whenever the word aviation comes under discussion, at once think of observation aviation, and mistakenly displacing the whole in their thoughts by a part, arrive frequently at erroneous conclusions. In their minds aviation connotes observation.

Were it true that the airplane had no rôle other than observation, there would be little that could be said in favor of a separate air force. Unquestionably observation must work in the most intimate liaison with ground troops on the fleet, and quite properly the observation units should form a component part of the land or naval unit to which they belong.

But observation aviation is far from constituting the bulk of the work of an air force. On the contrary, by the end of the World War, it comprised less than a fourth of all the airplanes on the western front, the remainder consisting of the airplanes of offensive aviation. Moreover, there is every reason to believe that the relative strength of the latter will tend to increase rather than decrease. There is no desire, of course, to underrate the inestimable value of the observation plane. But from a purely aerial point of view, it is of far less importance than the remaining branches of an air force. On the principle of the greatest good to the greatest number, it is obvious that air policy should be determined not by the needs of observation but by the needs of the air force, wherever the two should be found conflicting.

FIGHTING OVER THE SEA

Fighting over the sea is essentially the same as fighting over the land. The principles that govern it are derived from the air, which covers both alike. The same air force that today goes out to battle with hostile navies, tomorrow may attack his landing parties, and the next day join battle with the enemy land and air forces. In the first day it would co-operate strategically with the navy, in the last with the army; but throughout it would remain what it is in essence—neither army nor navy, but air force. Its liaison with both would be a very tenuous thing. It should be no part of army or navy, but should be a separate branch of the national defense, free to work out its own destiny, unhampered by the weight of older systems that utterly fail to answer its needs.

But what of observation aviation? Should it be a part of the army or navy, or should it too be brought into a separate air service? There is no question that the co-operation between observation aviation and the army or navy units it serves, must be intimate. But it must also keep in close liaison with the air force, if it is to operate safely and successfully. From the standpoint of purely tactical employment, there is much to be said in favor of either assignment. But there is still another point to be considered. Pilots and observers must be trained and airplanes designated, produced, and supplied. This work could unquestionably be better done by a separate air service. It is not necessary to destroy tactical unity; air organization, on the contrary would be placed under the orders of com-

manders of army and navy units. But it is believed that a separate air force could supply to the army and navy units better trained and equipped for observation than these older arms could produce for themselves. As to the wisdom of uniting the air forces of the government into one group, few who know the needs of the air can doubt—*Aviation,* 11 September, 1922.

ALL-METAL BRITISH AEROPLANE.—Orders to the value of between £200,000 and £300,000 are now being placed in connection with the increase in the strength of the Royal Air Force by twenty squadrons, something like 500 machines, including reserves. It is not the intention of the Air Ministry at present to put all-metal craft in production in any quantity.

Various all-metal and other types are already in course of construction, some of them being on the point of completion, and additional orders may be placed for all-metal machines in connection with the new twenty squadrons' scheme.

While attention has been concentrated to a certain degree on the new all-metal aircraft, other designs of ordinary construction are really just as interesting, if not more so, from the practical point of view of actual aircraft development.

It is well known, for instance, that the Air Ministry has had in course of construction for some time past very large types of flying boats for open sea reconnaissance work, some of which have been fitted with two Rolls-Royce Condor engines of 650-horsepower each, while others have been fitted with four of these powerful engines.

Other aircraft are now projected with a still larger engine of greater horsepower, the "Napier Cub," of over 1,000-horsepower. Probably one of the first craft to be fitted with these large new engines will be a bombing machine of very long range. About six all-metal machines of different types are already in course of construction by various firms at Kingston-on-Thames, Norwich, Byfleet, and Coventry. Some are designated as fighters, and others as troop-carrying planes, and for reconnaissance work of a character similar to that now being carried on in Mesopotamia.—*Naval and Military Record,* 23 August, 1922

DETACHABLE LANDING GEAR.—Lawrence Sperry has added to his other achievements, the inventions of a skid device so constructed that by simple mechanical means the whole landing gear of his airplane is released and dropped to the ground and a landing is made on skids. Mr. Sperry in a *Messenger* plane that has a usual run of 400 ft. has landed in one tenth of the distance.

The high speed of the *Messenger,* which is normally 99 m.p.h., was found to be 105 m.p.h. with the landing gear released.

The object of dropping the landing gear is three-fold. First, dropping the landing gear gets rid of the weight and head resistance of the landing gear, thereby increasing the performance in climb and speed of the plane.

Second, dropping the landing gear and landing on skids makes it possible to land in a much shorter space than hitherto.

Third, dropping the landing gear and landing on skids makes it possible to land on rough fields full of knolls and ditches, and also on water, without damage. (For the latter purpose, fuselage would be made water-tight.) It can also be used to advantage for heavily loaded flying boats which can take off the ground or ice, drop the landing gear and continue to fly over the water.

Superior performance can be obtained by dropping the landing gear. However, this will apply more particularly to the high-speed planes where the dropping of the landing gear will increase the flying speed some 10 m.p.h., depending upon the plane speed, at the same time getting rid of 90 or more pounds of weight.

The shorter distance of run with the skids is due to the friction between skids and the ground, whereby a run of one-quarter the usual distance is possible. This friction between the ground and skids is increased by the fact that the skids had been placed so that the machine presents a zero if not negative angle to the airflow. This means that at the beginning of the run there is no lift from the wings to detract from the friction of the skids and also no bouncing. The machine can be put on the ground at excess flying speed without bouncing. Landing on rough ground is made possible with skids because they have runners as in sleighs to bridge over ditches, thereby running more smoothly than with wheels.

The skids will permit landing on water, since the greatest obstacle to landing on water with the land machine is the landing wheels. The skids do not turn the machine over on its end on account of the fact that the center of gravity is so high above the wheels.

The plane used for the experiments was a *Messenger*. Releasing the landing gear is done by pulling a hand lever on the right hand side of the fuselage, which operates a cam, ejecting the four posts of struts simultaneously, so that it is impossible for one strut to remain fast and *joining* the release. Close to the landing gear under the fuselage is a small streamline case containing a small parachute weighing five pounds. The parachute is attached to the top of the four landing gear struts, so that the first thing to strike the earth is the tires, which transmits the load to the shock obsorbers.

During all of the experiments the same landing gear was used, without injury when dropping. The parachute could be used in a like manner over water, the buoyancy of the tires would support the gear and the white parachute would act as a mark, so that it could be found easily and pulled aboard ship.

The skids are so arranged that it is almost impossible to nose over in the roughest fields, which has been demonstrated by Mr. Lawrence Sperry landing on bumpy ground and running over a country road; this is due to the low center of gravity of the machine and the skids projecting so far forward.

The shock of landing is taken up by first landing on the rear end of the skids, which tends to stretch the front shock absorber rubber up to a point where the tail skid and landing skids are in line. Any additional shock is taken up by the shock absorber between the landing gear V struts. A nose on landing or hitting a bump is taken up by the front strut shock absorbers which are double acting.

When making a landing with the skids it is necessary to stop the propellor horizontally. This is done on the *Messenger* plane, which has a radial engine, by releasing the compression in two cylinders, and have the propeller so arranged that it will stop horizontally on the third cylinder.—*Aviation*, 4 September, 1922.

LARGEST AIRPLANE IN U. S. TO BE TESTED BY ARMY.—Washington, Sept. 8.—Results of extreme interest to the science of aeronautics are expected by army aviation experts to be obtained from the forthcoming trials at Fairfield, Ohio, of the largest airplane ever constructed in the United States.

The machine—a super-bomber triplane with a wing spread of 127 feet and carrying six Liberty motors totalling 2,400 horsepower—will have an estimated speed of 100 miles an hour, with a carrying load of 20,000 pounds. Its construction was begun in 1919 and carried forward secretly at the Whitte Mann Aircraft Company's plant, Hasbrook Heights, N. J.

Parts of the triplane recently sent from the New Jersey shops had to be shipped by circuitous routes to the Ohio station in order to get tunnel clearance for them on the railways.

The six motors are set in three pairs with one puller and one pusher to each group. The total weight of the machine including the carrying load, will be 30,000 pounds. A cruising radius of 1,300 miles is called for by the specifications, exceeding by hundreds of miles the radius of bombing machines now in the service.—*Baltimore Sun,* 8 September, 1922.

ORDNANCE

SHRAPNEL AND TIME FUSES.—The training section of the Reichswehr-Ministry sets problems every year to be solved by the officers of the various arms. This examination appears to have the objects of (1) testing the professional capabilities of officers; (2) encouraging professional studies, and (3) collecting opinions on important points. The main point is the first mentioned and, accordingly, the examination includes various tactical questions, problems in fortifications, sketching, map-reading, military history, economic geography, foreign languages, mathematics, and science, as well as armament and equipment.

In 1921, the problems for Artillery Officers under the last head were: "Can light artillery dispense with shrapnel and with time fuzes." The recently published comments on the papers deal with these two questions as follows:

The opponents of the retention of shrapnel for light artillery take the view that shrapnel can be entirely replaced by explosive shell with sensitive (instantaneous) fuzes, delay action fuzes (for ricochet action), and time fuzes (map shooting and ranging for line), and by canister shot. They put forward the following arguments:

At over 3,000 metres range, the effect of shrapnel is frequently insufficient. This is explained by the loss of striking velocity, by the steeper angle of descent and, above all (sic!), by the fact that, for example, skirmishers hear the report of discharge before the shrapnel bursts and can throw themselves down so as to offer a limited target.

The penetrating power of the balls, especially if they are made of steel instead of lead, is insufficient. This is especially the case with horses and with an enemy in winter clothing.

The possibilities of taking cover or avoiding shrapnel fire are much greater than in the case of shell-fire with H.E.

The moral effect of shrapnel-fire is smaller than that of high-explosive shell, which is due in large measure to the small report of the detonation of shrapnel in addition to the reasons given above.

If it is impossible to regulate the height of burst, the shrapnel shell loses appreciably in effect. Bursts which are too high have little effect; bursts on impact practically none. Hence, shrapnel cannot be used in the numerous situations in which it is not possible to regulate the height of burst, (e.g., when shooting by night or with low visibility, fire preparatory to an attack, searching behind crests and woods.)

The value of shrapnel for enfilading trenches and roads is over-estimated. For example, trenches can only be enfiladed when they lie exactly in the line of fire; but, even so, modern trenches, with their irregular form and numerous traverses, make an effective enfilade problematical. Roads, which are under observation within shrapnel range, bear little or no traffic in daytime, i.e., when it is possible to regulate the height of burst.

The use of the shrapnel time-fuze necessitates a different procedure to that of H.E. percussion fuze. Therefore the training manual would be much simplified by the abolition of shrapnel. Above all, it is much easier to master the art of shooting with H.E. percussion fuzes and delay action fuzes (ricochets) than that with shrapnel time-fuze; this is of great importance in war, when one must reckon with less well-trained forces.

The difficulty of storing large quantities of shrapnel in position warfare, so that the time-fuzes, which are subject to the influences of the weather, are adequately protected, must not be under-estimated.

The mass-production of a reliable time and percussion-fuze was a failure in the war owing to the lower care and skill of the labor available.

The incendiary effect of percussion shrapnel was wrongly estimated in peace time. Straw-stacks should be fired with H.E. shell, not with shrapnel; in the same way, at short ranges, H.E. shell have a better incendiary effect on thatched houses than shrapnel shells.

H.E. shell with delay-action fuze is more effective against masonry than shrapnel.

On the other hand the retention of shrapnel is urged because:

Shrapnel with time-fuze is excellent for use against visible living targets up to 3,000 metres range. Its claim to existence is based on the requirements of moving warfare. Stationary warfare is responsible for a reduced estimate of its value; but every power, when at war, will seek a decision in war of movement and in that shrapnel has fully substantiated its claim to existence.

The long forward-effect of shrapnel facilitates the searching of a large area, by the simultaneous use of various ranges, in a shorter time than is possible with H.E. shell. That is very important in the case of surprise fire on fleeting targets.

The advantage of the forward-effect of fire makes itself felt particularly against targets formed in depth. Every modern infantry attack offers such a target.

Shrapnel is of increased importance in situations in which the effect of H.E. shell with impact or delay-action fuzes is limited by the terrain or situation. Such is the case on marshy ground, on terrain covered with thick undergrowth or bushes, and at ranges up to about 1,200 metres, i.e., at the decisive point of the battle.

With shrapnel at short ranges, suitable fuze-setting produces a grapeshot effect, the most favorable fire effect for close-fighting.

The difficulty, which is alleged to have existed towards the end of the war, of achieving good results with the shrapnel time fuze, was chiefly due, not to insufficient training, but rather to the impossibility of regulating the point of burst with the badly burning fuzes. The English artillery is a proof of this, since, owing to superior fuzes, it could place the point of burst with absolute precision and obtained good effect. The English were, however, hardly better trained.

Weighing up the evidence of the opponents and supporters of shrapnel, one comes to the following conclusion:

If we do not succeed in manufacturing a thoroughly efficient shrapnel shell, with lead bullets and a fuze, which is independent of weather influences, and satisfactory powder in mass production, with less skilled workers, then the light artillery must dispense with shrapnel. If, however, it is possible to make such a shrapnel shell, for which a loud detonation is also desirable, then it should not be abandoned, for that would mean giving up a projectile, which, in special cases, is decidedly superior to H.E. shell. For the present, therefore, we cannot dispense with shrapnel.

The second part of the questions, as to whether the time-fuze can be dispensed with, is to be answered in the negative.

The time-fuze is absolutely essential to make calibration for map-shooting and testing lines of fire possible. With this object, some of the shells, including the *C* projectiles, must be provided with time-fuzes. Shooting for effect with H.E. time-fuze is seldom required, since the introduction of shooting for ricochet effect. The rarity of such cases would certainly not justify providing all shells with time and percussion fuzes. The H.E. time-fuze will be used for effect only against air targets.—*The Journal* of the Royal Artilley—September, 1922.

[*Note.*—Some of the arguments deduced against the employment of shrapnel shell are far from convincing. It should, however, be remembered that the German shrapnel shell was distinctly inferior in design and general efficiency to the British shrapnel.]

NAVY DESIGNS NEW GAS MASK.—Washington, Aug. 27.—Development of a new rescue breathing apparatus that permits the wearer to operate freely in smoke or gas filled compartments with his movements practically unimpeded has been perfected in the New York Navy Yard, according to report from the commandant, just submitted to the department.

Working in co-operation with the Bureau of Mines, the naval experts have succeeded in creating a new type of apparatus that weighs only fifteen pounds, overcoming all the objectionable features of the old types. The purpose for which the navy intends the new device is to permit entrance into compartments which are filled with smoke or deadly gases. The bulkiness of the old design makes it difficult for the wearers to go about rescue work.

The report to the department gives an explanation of the theory and practice followed in the design of the apparatus. In the process of breathing from ten to thirty-five per cent of the oxygen entering the lungs is absorbed by the blood; the remainder is exhaled with the nitrogen and carbon dioxide produced in the lungs. The exhaled air contains on an average about four per cent of carbon dioxide. If air containing as much as five per cent carbon dioxide is inhaled breathing is accomplished with difficulty; headaches and dizziness follow.

To provide an adequate supply of oxygen and to dispose of the carbon dioxide gas exhaled this new device has been designed to furnish a constant supply of oxygen at a respirable pressure and to eliminate as far as possible the carbon dioxide. It consists of a small cylinder of oxygen at 1,800 pounds pressure, sufficient for a half-hour's use; a rubber breathing bag which acts as an elastic chamber between the compressed oxygen and the lungs to facilitate breathing, and a canister filled with caustic soda or soda lime to absorb the carbon dioxide exhaled.

Headgears for holding the mouthpiece in place, gauges for indicating the amount of oxygen in the cylinder at any time and nose clips form secondary but necessary parts of the outfit.—*Baltimore Sun,* 27 August, 1922.

RADIO AND NAVIGATION

SENDING PHOTOGRAPHS BY RADIO CODE.—The various methods of sending pictures by wire or by radio have usually depended upon the use of a cylinder, like that of the earlier phonographs, about which the pointer of the transmitting mechanism travels spirally, like the recording needle of the phonograph. The receiving mechanism called for a cylinder of the same size, revolving in exact synchronism with the transmitting cylinder.

Among the earliest experimenters with this type of apparatus was Dr. Arthur Korn, of Berlin, who attained very notable results about ten years ago, but without producing an apparatus that was a commercial success. Now, however, Dr. Korn has demonstrated a new method that appears to overcome some of the objections to the earlier work, in particular discarding the receiving cylinder, the accurate synchronizing of which constituted one of the greatest difficulties of the earlier process. The fundamental conception of the new method has the merit of great simplicity. The signals transmitted by radio are merely successive groups of letters of the alphabet; and the receiving apparatus (associated with the ordinary radio-receiver) is merely a typewriter or other mechanical printer, so modified that it writes dots of various sizes instead of letters.

A description of Dr. Korn's new method, by which a photograph has been reproduced by radio across the Atlantic, is given by Arthur Benington in an article in *Radio Age* (Chicago) largely excerpted from the New York *World,* under the auspices of which newspaper the first successful transatlantic test of the method was made. After stating that the code message for the picture was sent from Rome, Italy, to Bar Harbor, Me., by radio and briefly recording other successful transmissions, the following description of the method is given:

"If you look through a strong magnifying glass at a half-tone picture in a newspaper or magazine you will observe it to be made up of a multiplicity of tiny dots, the very light part being of small dots widely spaced, the very dark spots of larger dots close together. Professor Korn, on analyzing photographs and half-tones, realized that for practical purposes all the values of light and shade could be reproduced with from fifteen to twenty sizes of dots.

"Suppose, for example, we take seventeen different sizes of dots and give to each a letter, say A for the smallest and P for the largest, the intermediate letters being for the intermediate shades. Now, if we can construct an apparatus which will automatically translate these seventeen values into seventeen corresponding letters and print these letters on a tape, we have a code which can be sent by wire or wireless to any place in the world, and if we have a typewriter that prints, instead of the letters indicated on the keys, the large or small dots which correspond to those letters, we can decode, or translate that telegraphic or radiographic message into a half-tone picture.

"This is just what Professor Korn did.

"The machine which does the coding is quite complex. In making a half-tone picture direct from the photograph, a wire screen with larger or smaller mesh, according to the fineness of the half-tone desired, is placed over the face of the picture and a negative photograph is taken through the screen, thus producing the dots.

"The Korn apparatus uses no screen, but a point of brilliant light traveling over the photograph, being cut on and off rhythmically by a commutator in such a way that it strikes the picture at accurately spaced points, working very much like the light of a moving-picture machine. An ordinary cabinet size photograph receives the light at about 1,000 points.

"The light passing through the negative falls upon a selenium cell, the quantity passing through depending on the darkness or lightness of the spot through which it passes. Selenium is a mineral crystal endowed with the peculiar property of passing an electric current only when exposed to light and of changing its electric resistance according to the degree of light that reaches it.

"Professor Korn makes use of selenium by placing a cell of it in the transparent cylinder on which the negative is coiled, and as the latter slowly revolves the light that passes through the negative falls on the selenium. A current of electricity from a battery passes through the selenium, and its resistance is varied by the values of the light.

"Each variation of resistance—of which in this case there would be seventeen—controls a key which drops to print a letter on a tape the instant it is actuated by the electric current. The mechanism by which the present Korn machine does this is too complexed to describe here; suffice to say that it prints the letter which corresponds to the particular shade of the photograph.

"In 'coding' a picture we get about 1,000 letters. These are grouped by spacing into about 300 'words' which are sent by radio (or by telegraph) to any place. They are received by an ordinary telegraph, or radio operator or by an automatic telegraphic receiving apparatus.

"To decode or turn this word message back into a picture, a Korn decoding instrument is necessary. This is a form of typewriter into which a sheet of paper about twelve by fifteen inches in size is placed. With the printed message before him the operator copies it on the keys; these, however, do not print letters, but dots of the sizes and shapes corresponding to the letters. As the code allows for the blank spaces between the dots the result is a very much enlarged half-tone of the original photograph, and this needs only to be photographed down to the size wanted by the paper; the smaller it is, the finer the half-tone. This decoding instrument may be attached to an automatic telegraph receiving machine in

such a way that the code letters are entirely cut out and the telegraph machine prints the dots directly.

"There are at present only two sets of Dr. Korn's apparatus in existence; one of these is in Germany, the sending machine, and the other is at Dr. Korn's laboratory at Centocelle, near Rome, and the receiving or decoding instrument is in America." *The Literary Digest,* 25 September, 1922.

REPORT ON DEPTH SOUNDINGS BY U. S. S. "STEWART."—1. Following is the report of tests of a new device; the Sonic Depth Finder made by the U. S. S. *Stewart* en route from Newport, R.I., to Gibraltar, June 20, to June 29, 1922.

2. The apparatus used for the tests was as follows:
   - (a) Standard Navy sound receiver.
   - (b) Submarine Signal Company's Fessenden type of sound oscillator for transmitting sound signals.
   - (c) Navy Sonic Depth Finder recently developed at the Engineering Experiment Station, Annapolis, Md.

3. The tests consisted of:
   - (a) Taking a line of soundings from Newport to Gibraltar, via Nantucket Lightship, Azores, crossing Josephine Bank and passing near Gettysburg Bank.

4. Test (a) For depths less than about ninety fathoms the depth was determined with standard Navy sound receiver, and depths greater than ninety fathoms were taken with the Navy Sonic Depth Finder, by measuring the time required for a sound signal to travel to the sea bottom and return. About 900 soundings in all were taken for depths varying between nine and 3,200 fathoms. This is an average of about 100 soundings a day. Except for one or two cases where the period between successive soundings was about one hour, the longest period between soundings was twenty minutes and the shortest period was one minute. The speed of the *Stewart* was maintained steady at 15 knots except about two hours when the speed was about 25 knots. During this latter period the *Stewart* steamed over depths varying between 900 and ninety fathoms. Throughout this part of the course soundings were taken with the ease at one-minute intervals by means of the Navy's new sounding device. A record of the sounding data taken is enclosed in the form of a contour curve drawn on a chart which covers the route taken, and on which the track of the *Stewart* is drawn. These data are clear and no comments are made thereon other than to say that the apparatus worked perfectly throughout the trip, and the results obtained have demonstrated that the contour of the sea bottom can now be readily determined with considerable accuracy.—Bureau of Engineering, *Bulletin.*

MISCELLANEOUS

SCRAPPING PROGRAM OF UNITED STATES.—The announcement by Secretary of the Navy Denby that no scrapping of new capital ships of the American Navy will be undertaken until all parties to the five-power naval treaty have exchanged ratifications, has served to emphasize the delay of France and Italy in action upon this and other treaties and agreements of the Washington Arms Conference.

Administration spokesmen deny that Secretary Denby's announcement indicated any suspicion of the nations which have failed to ratify, but in other circles there is frank skepticism particularly to the French intentions. A frequent expression is that France is taking this means in reprisal for our ignoring the frequent hints that we cancel the war indebtedness. Another interpretation is that she wants to have her hands free in order to have something to trade in the clashes she is having with England and possible eventualities in the Near East.

It was the Administration hope that the ratifications would come before election, for the reduction of naval armament is the one big achievement the Harding régime of which the Republican campaign orators meant to boast. But a year after the agreement, the naval reduction is still in the air, with all the countries holding all except the ships that would have been scrapped as obsolete without any conference.

The Administration still insists that ultimately all the treaties would be ratified, but that they no longer expect it in the near future.

The United States, Great Britain and Japan have ratified all of the treaties. Ratification was completed by the Senate months ago. Great Britain completed ratification August 1, and Japan on August 5. The British and Japanese ratifications are now on deposit in their respective embassies here and the diplomatic representatives of these powers only await the naming of a date by President Harding for the exchange of ratifications.

Portugal and China likewise have ratified all of the treaties and agreements to which they are parties, and their ratifications now repose in the Portuguese and Chinese Legations here.

The Arms Conference treaties have been discussed in the French Parliament and at its last session were referred to a committee of the French Senate with instructions to submit a report when Parliament meets again next month.

Even before the Arms Conference adjourned, Italian spokesmen made it clear that Italy would withhold action on the naval treaty pending its ratification by France. Apparently this policy is being strictly adhered to by the Italian Government, no action having been taken at Rome looking toward ratification of this or other Arms Conference treaties.

Belgium and Holland likewise have withheld action on the Washington treaties to which they are parties, and presumably they also are awaiting formal action by the French Government.

Senator Borah, among others, is decidedly pessimistic concerning the final outcome of the conference treaties and does not expect to see all of them ratified. Some naval experts are equally bearish, venturing the opinion that within a few years the nations will resume ship building.—*Baltimore Sun*, 27 September, 1922.

Vessels To Be Scrapped

Name of Vessel	*Where to be scrapped*	*Present status of*	*Age completed*
Maine	Sold to Hitner & Sons, Philadelphia.	Now being scrapped at Phila.	June 1, 1901
Missouri	Sold to Hitner & Sons, Philadelphia.	Now being scrapped at Phila.	Aug. 30, 1901
Virginia	To be sold at Boston Navy Yard	Being prepared for sale	Feb. 15, 1904
New Jersey	To be sold at Boston Navy Yard	Being prepared for sale	Feb. 15, 1904
Rhode Island	To be sold, Mare Island	Being prepared for sale	Feb. 15, 1904
Georgia	To be sold, Mare Island	Being prepared for sale	Feb. 18, 1904
Nebraska	To be sold, Mare Island	Being prepared for sale	

FLEET REDUCTIONS AND COMPARATIVE STRENGTH.—It may be doubted whether the general public even dimly appreciates the enormous reduction which the Royal Navy has undergone during the past three years. That a considerable number of vessels in each class have been transferred to the disposal list, and sold to be broken up at home or abroad, is com-

mon knowledge, but the full extent of this unparalleled clearance of naval material is realized by few. Many of the vessels thus discarded would have been excluded in any case from the postwar reorganization of the fleet, owing in part to deterioration in fighting value and in part to reasons of economy. Others, however, would probably have been retained for some years longer as ships still capable of performing useful work, had not the Washington agreement prematurely condemned them to the scrap heap. How far the process of reduction has gone is revealed by the fact that the Admiralty last week gave orders for the last capital ships affected by the agreement to have their armament disabled, preparatory to their being sold. The ships in question are the *Erin, Orion, Conqueror,* and *Monarch,* battleships, and the *Lion* and *Princess Royal,* battle cruisers, all of which were launched ten to twelve years ago. It is interesting to recall that the *Conqueror, Monarch, Thunderer* and *Princess Royal* were the "contingent Dreadnaughts" voted in 1909, as additions to the normal program for that year, these four ships representing the fruits of a vigorous agitation waged by the Press in favor of extraordinary measures to meet the menace of German naval expansion. The *Orion* class, of which the *Thunderer* is now to be the only survivor, were the first modern battleships to mount 13.5-in. guns, for which reason they were popularly referred to as "super-Dreadnaughts." At the outbreak of war they were among the most powerful units of the Grand Fleet. Still more remarkable, however, were the battle cruisers of the *Lion* type, comprising the nameship herself, the *Princess Royal,* and the ill-fated *Queen Mary.* Laid down two months before Lord Fisher's long term of office as First Sea Lord came to a close, the *Lion* embodied his tactical ideas to a pronounced degree—very high speed combined with tremendous hitting power, but only moderate protection—his intention being that these ships should fight at very long range, where their powerful guns could inflict heavy punishment on the enemy without giving his lighter armament a chance of replying with effect. At the Battle of Jutland circumstances apparently did not favor the employment of such tactics, for our battle cruisers engaged the enemy at medium range and were thus exposed to the full weight of his counter-fire. From the engineering point of view, the *Lion* was a most noteworthy ship. In the preceding *Indefatigable* class, machinery of 43,000 shaft horsepower had been installed to attain a speed of 25 knots. As the *Lion,* however, was designed for a still higher velocity and was the heavier ship by some 7,550 tons, her turbine engines, constructed by Vickers Limited, were planned to develop 70,000 shaft horsepower, a figure that seemed prodigious for those days. On trial at full power, with her boilers burning coal only, she worked up to 73,802 shaft horsepower, her speed being 27 knots. Her sister ship *Princess Royal* improved upon this by developing 76,510 shaft horsepower and 28.52 knots, thus establishing a record, which remained unbroken till the end of 1914, when the *Tiger* realized 104,635 shaft horsepower and 29 knots.

With the deletion of the six capital ships named above, our fleet now contains only eighteen battleships and four battle cruisers. It will eventually be reinforced by the two 35,000-ton battleships which are to be laid down early next year, but their completion will automatically displace four older vessels—*Thunderer, King George V., Centurion, Ajax*—bringing the total of capital ships down to twenty. It is interesting to compare this establishment with that which was maintained respectively in August, 1914, and at the date of the Armistice, more than four years later. At the opening of hostilities we had available for service twenty-two Dreadnaught battleships and nine battle cruisers, besides forty pre-Dreadnaughts and thirty-four armored cruisers. Completing or still on the stocks were ten battleships and one battle cruiser. This gave us an eventual strength of forty-two all-big-gun ships, plus seventy-four armored ships of the older type, an aggregate of no less than 116 ships. In the course of the

war our Dreadnaught fleet was augmented by three battleships, which were being built to foreign order, and two battle cruisers, additions which exactly balanced war losses so far as number was concerned. Our Dreadnaught strength therefore remained practically constant, but among the older armored ships casualties were exceedingly heavy and these, of course, were not replaced. The Armistice found us with the following nine; pre-Dreadnaught battleships, thirty; armored cruisers, seventeen—not counting old ships of this type employed on subsidiary duty. Today, of these eighty-nine vessels, only twenty-two remain with the fleet, a fact that conveys very strikingly the ruthless weeding-out which has taken place in the interval. We have, in fact, scrapped the entire pre-Dreadnaught fleet of forty-seven ships and with them have gone nine Dreadnaughts and six battle cruisers. The smaller types of fighting craft have, of course, been swept away in far greater numbers. Light cruisers have gone by the score and destroyers by the hundred, while the submarine flotilla has shrunk from 130 boats to fifty-eight. Other Powers have also effected reductions in their naval establishments, but, having far less material to dispose of, their combined effort in this direction falls very far short of ours. The present composition of the world's navies is shown in great detail in the Admiralty Return which was published recently by order of Parliament. Under the Washington Agreement the battle fleets of the British Empire and the United States are to be of equal strength, and that of Japan is limited to ten ships. Pursuant to this arrangement, the United States is required to scrap fifteen all-big-gun ships, of which only two were completed, and approximately a dozen battleships of older type; Japan, on her part, being pledged to discard twelve ships in all, including four that were unfinished. As the other two signatories, France and Italy, possess no capital ships surplus to their respective tonnage ratios, neither Power is called upon to scrap any of its existing material.

Passing from heavy ships of war to those of lighter types, we find that the British Empire has four aircraft carriers complete and two being built, though it might be more correct to describe the *Eagle* as being reconstructed. The United States Navy has only one carrier at present, but two of its cancelled battle cruisers are being redesigned for that purpose. Japan, which has one ship built and two under construction, is also preparing to convert two unfinished battle cruisers into aircraft carriers. In spite of the withdrawal of so many ships, the British Empire is still able to marshal an imposing array of light cruisers, viz., fifty-one built and eight being built. From the number we have unfortunately to deduct the *Raleigh*, which appears to be a total loss. The United States is credited with nine light cruisers built—all of which are obsolete—and ten being constructed, while the corresponding totals for Japan are twelve and thirteen, her completed vessels, with but four exceptions, being of modern design and high speed. Moreover, since this return was compiled, a new Japanese program of construction has been announced, which includes eight light cruisers. When therefore the factors of age, tonnage and speed are taken into consideration, it appears that Japan will eventually have the most powerful light cruiser fleet in the world. Our present superiority in this respect is largely discounted by the fact that most of our ships were designed for work in the narrow seas, and if required to engage in ocean cruising would be handicapped by their limited dimensions and fuel capacity. Both in destroyers and submarines the United States Navy now occupies the leading position. Of the former, it has upwards of 300, while we cannot muster two-thirds of that total. In submarines, the disparity will be especially marked, when, in accordance with the Admiralty's plans, our establishment is reduced to fifty-eight boats at the end of the financial year, or sixty-four boats if those in Australian service are included. By that date the United States will have 141 submarines built and being built and Japan fifty-six, plus twenty-four new

boats projected in the new shipbuilding scheme. The impression conveyed by a perusal of this official return is that the British Navy has indeed been "cut to the bone," and that but for the cordial relations now prevailing between Great Britain and the other principal maritime States our strength at sea would be grossly inadequate for the defense of the Empire. As it is, the One-Power Standard we are supposed to be maintaining applies only to capital ships and cruisers. In minor vessels, which nevertheless seem cast for a highly important *rôle* in future naval warfare, we are already outnumbered to an extent that in other circumstances would be disturbing.—*The Engineer*, 19 August, 1922.

ITALIAN BUILDING POLICY: NAVAL INCIDENTS IN CHINA: NORWEGIAN SUBMARINES: RUSSIA'S BALTIC FLEET.—It was reported in these columns some weeks ago that the Italian Government would probably decide to drop the two new cruisers for which appropriations were asked in last year's Estimates and build instead a number of smaller craft. This has now been confirmed. The Minister of Marine has laid before Parliament a project to apply the money voted for the cruisers to the construction of four destroyers and six submarines, besides seventy aeroplanes for the naval service, and this course seems likely to be taken. The cruisers thus abandoned were to have been vessels of 8,000 tons, with a speed of 34 knots and a main armament of 7.5-in. or 8-in. guns. However as the funds available for the navy were strictly limited, the authorities concluded that actual defense requirements would be met more suitably by strengthening the destroyer, submarine, and aerial arms, especially as the cession of ex-enemy warships had brought the light cruiser squadron up to eight modern units. A good deal of money has been spent on reconditioning the prizes, several of which are still in dockyard hands. It is stated that the two best ships are the *Ancona* (ex-*Graudenz* and *Bari* (ex-*Pillau*). The ex-Austrian vessels *Brindisi* and *Venezia* (formerly *Helgoland* class) are built too lightly and have too small a fuel capacity for long-distance cruising. Italian naval experts say that German construction was very sound and practical, but that the Austrians tried to get too much on a given displacement, and only succeeded in turning out fair-weather ships. This seems to have been equally true of the Austrian battleships, judging by the ease with which the *Szent Istvan* and *Viribus Unitis* succumbed to underwater attack.

The Japanese battleship *Suwo* (ex-Russian *Pobieda*), which was being dismantled at Kure Dockyard, tried to forestall the operation on July 13 by capsizing alongside the wharf. It appears that workmen had incautiously removed a section of plating that continued below the waterline, and when the rivets were knocked out the water rushed in so quickly that the ship soon lay over on her beam ends and foundered. Her four 10-in. guns had already been removed, but the rest of the armament was still in place. Fortunately, the ship took sufficiently long in heeling over to allow all on board to save themselves. It is supposed that the removal of all the coal, stores, and armor-plate had made the vessel top-heavy, so that it required the entrance of very little water to cause her to capsize. The class to which the *Suwo* belonged were notoriously unstable. A sister ship, the *Osliabia,* was sunk in the battle of Tsushima. As leading ship of the port column she was brought under the concentrated fire of Admiral Togo's fleet and reduced to a blazing wreck thirty minutes after the action began. The *Pobieda* was salved after the Russians had scuttled her at Port Arthur. Most of her original guns were retained, but the Japanese found it expedient to improve the stability by loading her with 800 tons of ballast. As reconstructed the ship displaced 13,500 tons, her speed being reduced from 18 knots to 16. In 1902 she represented the Russian Navy at the Coronation Review held at Spithead. The third vessel of

this type, *Pereviet,* also sunk at Port Arthur, was salved and commissioned under the Japanese flag as the *Sagami.* She was afterwards retroceded to Russia, but was destined never to return to the Baltic, a *U*-boat torpedo or mine putting an end to her career in January, 1917, while she was serving in the Eastern Mediterranean.

Messages from the Far East dealing with the recent civil strife in China give some details of the naval events which occurred in connection with the flight of Sun Yat-sen, the former President of the Cantonese Government. Sun took refuge on board a gunboat of the Canton flotilla, which remained loyal to him, and with four other vessels steamed up the river, finally anchoring in front of the Shameen, where his enemies could not bombard him without jeopardizing the foreign settlements. The opposing faction under General Chen Chung-ming had previously seized the Whampoa forts, and prepared to give Sun's ships a warm reception if they ventured up the river. It was necessary to do this, however, as a battery of 4-in. guns had been mounted lower down the river, and the flotilla was therefore exposed to a cross-fire. Finding their position untenable, all five ships weighed and proceeded up-stream at their best speed. A fierce fire was opened on them from fort and battery, but, thanks to poor visibility and wild shooting, they got through with only slight damage, the only serious hit taking effect on a destroyer, which had ten casualties. As soon as the flotilla came to anchor off the Shameen Bund, near the foreign gunboats, the Chinese commander was informed that strong action would be taken if he fired a single shot from his ships. Meanwhile H.M. gunboats *Moth* and *Tarantula* and an American destroyer cleared for action. Sun Yat-sen was requested to take his flotilla elsewhere, but this he refused to do, and eventually it was decided that he should remain there on undertaking not to open fire unless attacked by Chen Chung-ming.

Schiffbau reports the launch at Horten naval arsenal, on August 1, of the first submarine ever built in Norway. The earlier boats *A1* (ex-*Kobben*) to *A4* were built at the Germania Yard, Kiel, and have a surface displacement of 225 to 250 tons. The two new submarines, *B1* and *B2*, are considerably larger than those constructed in Germany, their length over all being 167.3 ft., the greatest breadth 17.4 ft., and the displacement 420 tons. On the surface they will be propelled at a speed of 14½ knots by Diesel engines supplied by Sulzer Brothers of Winterthur, while the electro-motors, which are entirely of Norweigian manufacture, will give a submerged speed of 8½ knots. Immediately after the launch of *B1* she was subjected to pressure and watertight trials, which in the absence of a pressure dock were carried out by lowering the boat to a depth of 164 ft. by means of a large floating crane. Work was begun on this vessel as long ago as 1915, but the abnormal conditions prevailing in the war and post-war period greatly retarded her construction. It is hoped to have *B1* ready for her sea trials early next year. The second boat, *B2*, is still on the stocks, and is not expected to take the water for another twelvemonth.

The following notes on the Russian Baltic Fleet come from a correspondent who is usually well-informed, but they are given here with all reserve: "The fleet at Kronstadt is much weaker than the Admiralty Return would lead one to believe. Of the battleships only the *Sebastopol* (now *Marat*) is really efficient; not one of the others could get to sea unless they had months of hard work put into them by skilled artificers. The number of efficient destroyers is very hard to estimate with accuracy, but I put it at twelve, with probably the same number of submarines. From the larger vessels quite a number of guns, from 4.7-in. downward, have been commandeered by the army and mounted on field carriages, and many searchlights have been removed for the same purpose. The dockyard at Kronstadt is practically deserted, and it is long since any serious

work was done there. The German Mission which was reported to be on its way to reorganize the yard had not arrived by the middle of July. Finnish shipping men scoff at the idea of the Red Fleet as a serious proposition, and declare that they would tackle it single-handed if they could only get a few discarded warships from one of the Powers. On the other hand, there are reports that the fleet is being thoroughly overhauled and refitted, also that Trotsky is doing his best to induce former officers of the Imperial Navy to rejoin the service by promising them a free hand as regards discipline. The one fact which seems beyond dispute is that the Baltic Fleet is at present a negligible quantity, whatever it may be a year or two hence."—Hector C. Bywater in the *Naval and Military Record,* 13 September, 1922.

THE MATERIAL OF NAVIES.—With the relative strength of the principal Sea Powers in capital ships fixed for the next ten years by the Washington Conference, the tables of battleships and battle cruisers contained in the recent official Return of Fleets, issued at the request of Lieutenant-Colonel Sir Alan Burgoyne, lose a good deal of their interest. Much the same is true of the section showing cruisers, for these vessels belong to quite an obsolete class, and, except for the British *Courageous* and *Glorious,* completed in 1917, are all ships completed well before the outbreak of the war. The monitor table might also be passed over but for the interesting group of Italian vessels of the *Monte Cengio* type. Completed in 1918-19, these ships, which were not listed in the *Return* last year, are of 575 tons, and carry one 15-in. gun and a machine gun apiece. They are propelled by internal combustion motors of 700-horsepower. Two smaller craft of 360 tons, the *Cucco* and *Vodice,* each carry a 12-in. gun. Doubtless the Italians evolved these designs out of the needs revealed in the war, when British monitors lent to them were able to bombard the Austrian positions and communications on the Lower Isonzo and other places. But it will be interesting to see whether the craft are retained in the postwar Italian Navy.

Coming to the light cruisers, a type of increasing importance in future fleets, an examination of the Return will show how unreliable mere numbers are as a guide to comparative strength. The British Navy is credited with fifty-one such vessels (including five for the Dominions); America with nine; Japan, twelve; France, five; Italy, ten; Russia, one; and Germany, three. But these vessels range in displacement from the 3,218 tons of the Italian *Quarto* to the 9,750 tons of the British *Hawkins;* and while all but two of the British vessels are under ten years of age, all the American ships are fourteen years of age or over, and one, the *Cleveland,* was launched as far back as 1901. It can safely be deduced from the *Return,* however, that Britain has now the strongest light cruiser fleet of any Power, but large numbers of her war-built ships will become obsolete before very long, and when that happens the building program of America and Japan will make them serious rivals to us in this respect, even if they do not surpass us. America has in hand the ten 7,500-ton vessels of the *Omaha* type, each mounting twelve 6-in. guns; and Japan thirteen vessels of the *Kuma* and *Kinu* types, each armed with seven 5.5-in. guns. It is rather surprising that no light cruisers are in hand for Italy.

In the important matter of aircraft-carriers, the *Return* shows little change from last year. The British Navy has the same four vessels, the *Furious, Argus, Pegasus* and *Ark Royal,* with the *Hermes* and *Eagle* under construction. The United States, too, has the same ship, the *Langley,* but in her building list, in place of the 14,240-ton ship *Wright,* an ex-merchantman which was included last year but has now disappeared, there are the two ex-battle cruisers *Lexington* and *Saratoga.* A new aircraft-carrier in the Japanese Fleet is the *Wakamiya,* but she is a comparatively small vessel of 7,600 tons, and was originally a naval transport.

There are four aircraft-carriers building for Japan, the *Hosho* and *Shokaku,* and the ex-battle cruisers *Akagi* and *Amagi.* For France there is completing the ex-battleship *Béarn.* This country, therefore, although it has fewer aircraft-carriers altogether than were used for the Grand Fleet alone during the war, is at present well ahead of the other Powers in this respect. But this class of vessel is still in the tentative stage, as was recognized at Washington when it was specifically laid down that "all aircraft-carrier tonnage in existence or building on November 12, 1921, shall be considered experimental, and may be replaced, within the total tonnage limits, without regard to its age."—*Army, Navy, and Air Force Gazette,* 26 August, 1922.

SIR PHILIP WATTS' VIEW.—In the course of a lengthy letter to *The Times* Sir Philip Watts made a notable contribution to what he himself terms "the great sea and air controversy." None can be better qualified than the famous ex-Director of Naval Construction to speak upon this subject: no opinion will command more respect than his amongst those who seek for such enlightenment as can be shed by the views of high authority upon the great problem. For it is to the genius of Sir Philip Watts that we owe the Dreadnaught. Others may have seen—undoubtedly did see—that the all-big-gun ship was indicated by the experience of *Tsushima*: Sir Philip Watts designed her. In the course of his letter he points out how, in the earlier classes of the Dreadnaught type, the chief difficulty with which his department had to cope was to devise protection against torpedo attack. For the submarine was the urgent menace in those days; not the aircraft. During the Great War the pre-Dreadnaught battleships which were torpedoed—as in the Dardanelles—came off very badly. On the other hand, the only three ships of the Dreadnaught era (*Audacious, Marlborough,* and *Inflexible*) which were seriously damaged by under-water attack withstood the onslaught, and but for a combination of bad weather and bad luck we now know that the first-named vessel would have been saved.

The point which Sir Philip Watts manifestly seeks to emphasize is that, just as the growth of the torpedo menace resulted in a satisfactory development of protective measures, so is the aerial threat likely to bring a corresponding antidote. Even if the aircraft had not entered into the category of hostile conditions against which the capital-ship designer has to provide, the great increase of range of naval artillery has produced a very similar form of problem. For a projectile discharged from a range of 20,000 yards has such a high trajectory that it spends what gunners term its remaining velocity in a nose dive. In fact, plunging fire is so much akin to aerial torpedo attack in its effect that even had the latter not come into existence the naval designer would have had to devise resistance against the former. "What we did not contemplate with the Dreadnaughts," writes Sir Philip Watts, "was that descending shell could penetrate our upper and main decks and fittings and travel considerable distances before exploding; it was anticipated that the shock would cause the fuse to act and the shell to burst before reaching the protective deck." In short, the delay action fuses which the Germans employed to such deadly advantage both in sea and land warfare had not then been contemplated.

It may well be that the new methods of attack will result in a revolutionary change in the whole system of armor protection. Since the capital ship is more likely to be menaced in future by attack from the air or from under the water than by direct broadside fire, her broadside belting may have to be distributed over her deck, and broadside protection effected by means of "blister" sides and honeycomb bulkheads. The naval architect cannot impose more than a certain limited ratio of weight upon total displacement, and this is bound to be reduced in proportion as it is placed

higher in the hull. Probably the one salient point which the experiments with aircraft versus armored ships is intended to solve is the relative value of broadside and deck protection under present-day conditions.

It is gratifying to find that, in conclusion, Sir Philip Watts expresses himself as "strongly in favor" of the policy of the Admiralty in deciding to lay down two new battleships. He reminds us experience has shown that the serious possible hits, whether from the sea or from the air, will very seldom be made against a fleet maneuvring in battle. At Jutland the *Marlborough* was the only British ship struck by a torpedo, although large numbers of torpedoes were fired by the Germans. Indeed, Sir Philip Watts declares that if the later classes of Dreadnaughts were "suitably strengthened" they would give a good account of themselves in any war which might take place within the next fifteen or twenty years. It is our belief that the bulk of naval opinion holds the same view: a view which must necessarily be greatly strengthened by the exceptional qualifications of the authority who now confirms it.—*Navy and Military Record,* 23 August, 1922.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"The Design of Shallow-Draught River Steamers"—*Engineering,* 25 August, 1922.

"The Sulzer Two-Stroke Diesel Engine" (Illus.)—*Engineering,* 25 August, 1922.

"The Oil Supply of the World."—David White in *Mechanical Engineering,* September, 1922.

"The Influence of Rivet Holes on Steel Structures" (Illus.)—*Engineering,* 8 September, 1922.

"Tests of Concrete in Sea Water"—by L. C. Watson, in *American Society of Civil Engineers,* September, 1922.

"Tests of a 60,000 Kw. Cross-Compound Triple-Cylinder Steam Turbine" (Illus.)—*Engineering,* 1 September, 1922.

"Some Devices of War": (1) "Use and Abuse of Submarines," by Rear Admiral W. F. Fullam, U. S. N. (2) "Aircraft vs. battleship," by Captain R. C. Smith, U. S. N. (3) "Chemical Warfare in the Future," by Captain J. M. Scammel, Chief O. R. C.—*North American Review,* October, 1922.

"Notes on Water Work in Submarine Mining," by Lt. Col. John M. Dunn, C. A. C.—*The Coast Artillery Journal,* August, 1922.

"The Northern Blockade. A Lecture Delivered at the Royal Artillery Institution," by Admiral Sir Dudley R. S. de Chair,—*The Journal of the Naval Artillery,* May, 1922.

"Gliding Experiments in Europe—1922" (by an eyewitness).—Edward P. Warner in *Aviation,* 25 September, 1922.

"Air Power and the Empire"—*The Nineteenth Century Review,* September.

"The Helicopter and the Variable Pitch Propeller"—*Mechanical Engineering,* September, 1922.

"The Earth Inductor Compass" (for airplanes.)—*Proceedings of the American Philosophical Society,* Vol. LXI, 1922, No. 1.

"Technical Requirements of Pursuit Aviation" (Illus.), by William D. Tipton, in *U. S. Air Services,* September, 1922.

"Duplex Radio Telephone Transmitter"—*General Electric Review,* August, 1922.

"The Naval War College—An Appreciation," by Maj. R. H. Smith, C. A. C.—in the *Infantry Journal,* September, 1922.

"The Strategy and Tactics of Small Wars," by Maj. S. H. Harrington, U. S. M. C.—in the *Marine Corps Gazette,* March, 1922.

"Battleships,"—by Admiral Sir Cyprian Bridge and Rear Admiral Sir Eardley Wilmot—in the *Nineteenth Century Review,* September, 1922.

"The Race for Sea Power" (Anglo-American merchant marine competition), by Archibald Hird,—*Fortnightly Review,* September, 1922.

"The Irish Free-State and British Empire Defense," by Major General Sir George Aston,—*Fortnightly Review,* September, 1922.

"Far Eastern Reflections," (Japanese Policies Criticized), by H. K. Norton—*Contemporary Review,* September, 1922.

"The American Shipping Bill," by C. E. Foyle,—*Edinburgh Review,* July, 1922.

"Pertinent Articles," in—*American Journal of International News* for July, 1922:

(1) "Some Aspects of the Work of the Department of State," by Charles E. Hughes.

(2) "Some Observations on the Conduct of our Foreign Relations," by Charles E. Hughes.

(3) "Seizures in Land and Naval Warfare Distinguished," by M. O. Hudson.

(4) "The Rights of Visit and Search, Capture, Augary, and Requisition," by J. C. Wise.

(5) "Orders in Council and the Law of the Sea," by G. E. Sherman.

New Quarterly on Foreign Affairs.—The first number of a new American quarterly review entitled *Foreign Affairs* appeared on September 15. The review is edited by A. C. Coolidge, of Harvard University. The leading article is on "Popular Diplomacy" by Elihu Root. Among others may be noted "The Policy of France," by André Tardieu; "The Little Entente," by Edward Benes; and "The Mandates in the Pacific," by George H. Blakeslee. The purpose of the magazine is to promote American discussion and knowledge of international affairs. An appendix gives a valuable list of current books and source material on the subject.

NOTES ON INTERNATIONAL AFFAIRS

FROM SEPTEMBER 5 TO SEPTEMBER 25

PREPARED BY

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NEAR EAST

RESULTS OF TURKISH VICTORY.—Following the capture of Afiun Karahissar in August, the Turkish forces in Asia Minor advanced steadily and by a series of victories in the first week of September, forced the surrender of Smyrna and the evacuation of Greek troops from Asia Minor. The Turkish forces entered Smyrna on September 9. On September 11 a fire swept the city, leaving at least 200,000 Christian refugees. Many Christians were deported to the interior.

BRITISH PROPOSE ALLIED ACTION.—On September 12 the British Government proposed to the French and Italian Governments concerted action to assure the defense of Constantinople and the neutral zone of the straits. The British Atlantic fleet was despatched to the Mediterranean and a call for aid was sent to British Dominions.

Although the Entente Commission at Constantinople warned the Kemalist representative as to the serious effect of an invasion of the neutral zone, the French and Italian forces were withdrawn from the eastern side of the Dardanelles, only the British remaining. In France, the Turkish victory was regarded as favorable to French aims, and a passive attitude was advocated.

On September 19 it was reported that the French Government had received from Mustapha Kemal a promise not to enter the neutral zone upon the understanding that Turkey should receive Eastern Thrace up to the Maritza river, including Adrianople.

JOINT NOTE TO TURKS.—After much discussion the Allied Governments on September 23, reached agreement and dispatched a joint note to Mustapha Kemal, as follows:

The three Allied Governments ask the Government of the National Grand Assembly to be good enough to let them know if it is disposed to send without delay representatives with full powers to a meeting to be held at Venice or elsewhere and to which will be invited also, with the representatives of Turkey, plenipotentiaries of Great Britain, France, Italy, Japan, Rumania, Jugoslavia and Greece.

This meeting will take place as soon as necessary arrangements are made by the Governments concerned. The object of this meeting will be

to negotiate and consolidate a final treaty of peace between Turkey, Greece and the Allied Powers.

The three Governments take this opportunity to declare that they view with favor the desire of Turkey to recover Thrace as far as the River Maritza and including Adrianople.

On condition that the Angora Government does not send armies during the peace negotiations into zones, the provisional neutrality of which has been proclaimed by the Allied Governments, the three Governments will willingly support at the conference attribution of these frontiers to Turkey, it being understood that steps will be taken in common agreement in the treaty to safeguard the interests of Turkey and her neighbors, to demilitarize, with a view to the maintenance of peace in certain zones to be fixed; to obtain peaceful and orderly re-establishment of Turkey's authority, and finally to assume effectively under the League of Nations maintenance of the freedom of the Dardanelles, the Sea of Marmora and the Bosphorus, as well as protection of religious and racial minorities.

For the rest, the three Allied Governments will willingly support the admission of Turkey to the League of Nations. They are in agreement in reaffirming their assurance, given in March last, that they will withdraw their troops from Constantinople as soon as the treaty of peace has entered into force.

The three Allied Governments will use their influence to procure before the opening of the conference the retirement of the Greek forces to a line to be fixed by the allied Generals in agreement with the Greek and Turkish military authorities.

In return for this intervention the Government of Angora will undertake not to send troops, either before or during the peace conference, into the zones of neutrality which have been previously declared and not to cross the Straits or the Sea of Marmora. In order to fix the above-mentioned line, a meeting might immediately take place between Kemal Pasha and the Allied Generals at Mudania.

The Allied Governments are convinced that their appeal will be listened to and that they will be able to collaborate with the Turkish Government and their allies to establish peace, for which the whole civilized world is longing.

(Signed) POINCARE.
CURZON.
SFORZA.

TURKISH REPLY.—While negotiations were proceeding, Turkish forces entered and intrenched within the neutral zone. It was reported that the Turkish reply to the Allied invitation would be acceptance on condition that military movements be permitted during the Conference, and that Russia, Persia, and Bulgaria be allowed to take part. In case this reply was satisfactory the preliminary armistice conference to arrange for the cessation of hostilities between Greeks and Turkish Nationalists would be held at Mudania, on the Sea of Marmora, on or about October 2.

ABDICATION OF CONSTANTINE.—As a result of revolt in the army and navy and popular hostility following the defeats in Asia Minor, King Constantine of Greece abdicated on September 27, in favor of his son, Crown Prince George.

GERMANY

ARMY OCCUPATION EXPENSES.—Two articles in the September, *Fortnightly Review,* one by Dr. E. J. Dillon, quote from German sources extraordinary figures regarding the expenses of Allied forces in the occupied territory. According to these figures, there were on January 1, 1921, 131,000 men in the occupying armies. The Rhineland High Commission has expanded from 4 to 1,300 officials, who have expended money lavishly for personal accommodations. According to British figures Germany up to February, 1922, had paid £46,000,000 reparation to Great Britain, and the cost of the British Army of Occupation has been £53,000,000.

SETTLEMENT WITH BELGIUM.—On September 1, the Allied Reparation Commision gave Germany the privilege of suspending reparation payments upon conclusion of an agreement with Belgium for acceptance of six-month bonds in lieu of the 270,000,000 gold marks, due by priority to that nation. Germany at first proposed to the Belgian Government payments extending over eighteen months, and latter declared its inability to fulfill Belgium's demand for a deposit of 100,000,000 marks in gold in some foreign bank as security. The Belgian conditions were finally met by the deposit of German gold or securities abroad in a location not revealed as collateral for a guarantee of the bonds by the Bank of England.

RESTORATION AGREEMENT.—On September 5 it was announced that Hugo Stinnes, the German industrial magnate, had concluded a private agreement with French co-operation societies for the supply of thirteen billion francs' worth of German building materials for the restoration of French devastated regions, the cost to be credited to Germany's reparation account, with six per cent profit to Stinnes.

LEAGUE OF NATIONS

MEETING OF ASSEMBLY.—The Third Assembly of the League of Nations met at Geneva on September 4. Augustin Edwards, head of the Chilean delegation, was elected president. The Peruvian delegation was not present and Bolivia formally withdrew on September 10. Special committees were appointed to consider the problem of financial aid for Austria, the Cecil plan for disarmament, and other problems on the agenda. The Assembly later adopted the Council's proposal that the number of small states represented in the Council be increased from four to six. This in future will give the small states a majority, but the four great powers in the council are protected by the rule requiring unanimity on all important questions. The action was taken as a result of agitation against the domination of the Council by the Allied powers. Proposed changes in Article X of the League covenant were shelved until next year.

CECIL DISARMAMENT PLAN ADOPTED.—Geneva, Sept. 13.—The Disarmament Committee of the Assembly, on which all members of the League of Nations are represented, adopted today a resolution embodying Lord

Robert Cecil's plan for a series of protective treaties. The resolution instructs the Permanent Disarmament Commission to prepare in consultation with the Governments a treaty on the lines laid down by Lord Cecil and asks that the Governments give formal adhesion before the next session of the Assembly in September, 1923.

Chief interest in the plan centers in a European peace compact, Europe being the continent most in need of peace. The British, French and Italian Governments have gotten behind the Cecil plan and are pushing it. First England favored it, and France has swung well into line.

Today's motion provided for the drafting of a treaty by the commission alone, its submission to the Governments, and a request that these give a yes or no reply to the next assembly. M. de Jouvenal, France, argued that the proper step was to consult the most important Governments in drafting the treaty, so that when finished their adhesion would be assured. This plan was adopted.

Lord Cecil is Chairman of the Permanent Disarmament Commission and will direct the drawing up of the treaty. The action of the committee today is sure to be approved formally by the Assembly. It is intended to have the treaty submitted to all the Parliaments before next September. If England, France, Italy, Spain and Czechoslovakia can agree on the terms the treaty will have important promises.—*New York Times*, 14 September, 1922.

FAR EAST

JAPANESE POLICY.—Writing in the September *Contemporary Review* on the Far East, Mr. H. K. Norton speaks as follows of the results of the Washington Conference:

> Those Chinese and Russians who have struggled directly against the advance of Japanese arms and who are most distrustful of Japan's methods point to the agreement upon the limitation of naval armaments as a sinister victory for Japanese militarism. Their contention is that Japan has secured by this agreement a naval ratio which she could not hope to maintain under competitive conditions. While this ratio deprives her of the power to take the offensive against America, and thus relieves America of all fear of danger to her Pacific Coast, it is equally effective in depriving America of the power to take action against Japan in Asian waters. As pacifist theory this is wholly commendable. But in the eyes of Koreans, Russians, and Chinese, who are in various stages of suppression by Japanese arms, it appears little short of a catastrophe. It means to them that Japanese militarism is to have a free hand on the continent of Asia, and that the one friend to whom they have hitherto looked for assistance had rendered herself powerless to help them. The only ray of light they can see now is the possibility of Great Britain and America joining together to restrain Japan, a ray which does not do much to dispel the gloom of their despair.

Of the situation in Shantung he remarks that the Japanese are to all appearances carrying out in good faith the agreement to turn over the railway to China,. yet have demanded the $30,000,000 paid by Germany plus $168,000,000 for Japanese improvements. This sum is prohibitive, though Japan has intimated a decrease if China proves herself "sincere," in other words grants satisfactory concessions elsewhere.

In Southern Manchuria the twenty-five-year lease of the Liaotung peninsula and the railway to Mukden, which Japan took over from Russia, will expire next year. China refuses to recognize the validity of the

ninety-nine-year extension extorted as one of the Twenty-one Demands. The administration of the railway through the rest of Manchuria is also an unsettled problem. At present it is under an Inter-Allied Board, with five Russians and six Chinese as directors.

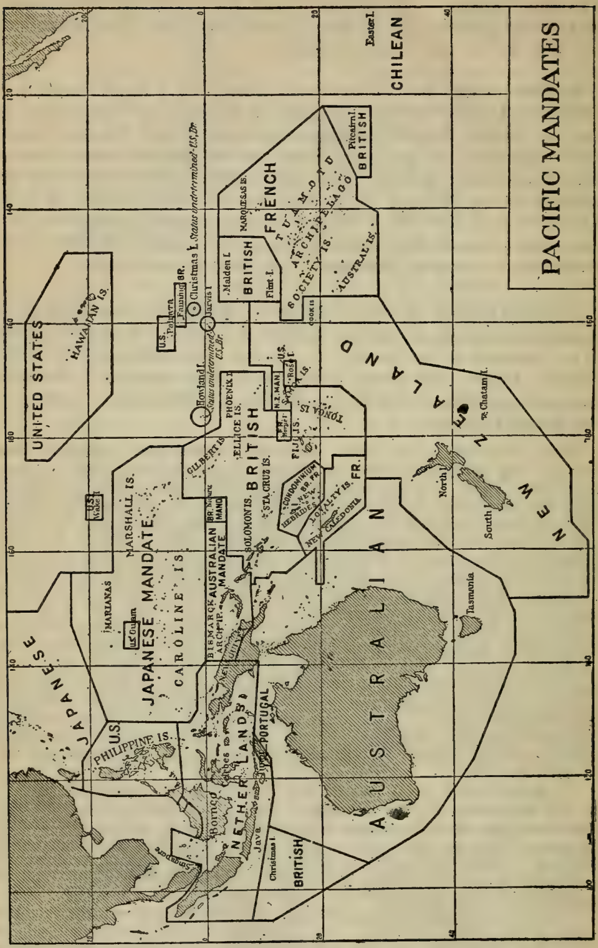
RUSSO-JAPANESE PARLEY ENDED.—According to a press despatch of September 25, the conference between Japan, the Chita Government of the Far Eastern Republic, and representatives of the Moscow Government was broken off by Japan. Japan entered the conference to secure a trade agreement with the Chita Government, and consented only unwillingly to the inclusion of Moscow representatives headed by Joffe. The latter bent their efforts toward securing Japanese recognition, and, upon failure to gain this, finally demanded that Japan set a date for the evacuation of Northern Sakhalien. This Japan refused to do.

JAPANESE CONTROL OF PACIFIC ISLANDS.—Of Japan's Government of its mandate islands, an interesting account is given in an article entitled "The Mandates in the Pacific," in the new American quarterly review *Foreign Affairs*. The article is written by Prof. George H. Blakeslee, American specialist in Pacific problems at the Washington Conference. An extract follows:

From October, 1914, when Japanese forces first occupied these islands, they remained under the control of the Japanese Navy Department until April 1, 1922, when a purely civil South Seas Government came into operation, which is responsible directly to the Imperial Cabinet. The Japanese undertook the administration of the islands with commendable earnestness and energy. Experts and high officials visited the archipelagos in large numbers in the early months; the native chiefs were taken on visits to Japan; roads were built, additional cocoanut trees planted, navigation buoys placed, surveys made; a regular subsidized steamship service to the islands was established; and trade and commerce with Japan were furthered. Due to wartime regulations, the government was able to give Japanese a virtual monopoly of trade and commerce. The Germans were all sent away, other foreign traders discouraged, commerce in general restricted to Japanese ships, and all foreigners forbidden to enter or leave the islands without special permission, usually difficult or impossible to obtain. Under these conditions Japanese commercial companies established themselves in the islands and invested considerable capital, and the number of Japanese increased from 83, before the war, to 3,671 in 1920.

In military and naval matters the Japanese have completely lived up to the provisions of the Mandate. They have built no fortifications, established no naval bases, and have not trained the natives for military purposes. But, as they have a right to do, they have established radio stations, at least eight of them, four being powerful enough to communicate with Japan, have begun experiments with aeroplane flights, and are maintaining a small police force numbering less than a hundred.

The most striking feature of the Japanese administration is the establishment of elementary schools. The Germans had no government schools, leaving the education of the natives entirely to American and German missions; but the Japanese Government, with much the same spirit which actuated the American Administration in the Philippines, is extending



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elementary schools as rapidly as possible and requiring the attendance, wherever the schools are available, of all children from 8 to 15 years of age. Wherever government schools have been established, the school authorities have refused to allow native children of school age to attend the mission schools.

The Japanese administration as a whole has been energetic, progressive —as is shown by their schools and by their care for the health of the natives—and in general fairly efficient. On the other hand, there has been over-administration, a too careful supervision of details, too many officials, occasional annoyances and injustice due to petty naval officials, and an attempt to hustle the simple natives too fast.

As to American rights and interests, the Japanese, the past few years at least, have been placing no obstacles in the way of the evangelistic work of the American missions. The regulation, however, forbidding native children between 8 and 15 to attend the mission schools would appear to be in violation of the new treaty regarding the Mandate, although they may reasonably insist upon proper educational standards in these schools and upon instruction in Japanese. With the inauguration of the new civil government, this regulation, as well as those which have practically closed the islands to American trade and commerce, will naturally be modified.

REVIEW OF BOOKS

NAVAL OPERATIONS, VOL. I (TEXT) TO THE BATTLE OF THE FALKLANDS, DECEMBER 1914. By Sir Julian S. Corbett. (Longsman & Co. Price $6.50.)

A Review by Rear Admiral Albert Gleaves, U. S. Navy.

The *Official History of Naval Operations* is to be completed in several volumes, probably five or six. The series will be an invaluable contribution to the literature of the World War.

As an accurate and concise writer of British naval history, Sir Julian Corbett is well equipped for this task, and his selection by the Admiralty to write the official history is peculiarly appropriate. The initial volume justifies the choice. Although the Admiralty accepts no responsibility for the opinions of the author, the archives have been placed at his disposal, and the history will therefore bear the stamp of authenticity.

The Introduction is an epitome of the book, and the ensuing chapters amplify the operations on the Belgian coast, the offensive against the German overseas possessions, development of submarine warfare, the exploits of the commerce destroyers, the convoy of troops during the imperial concentration, and what is aptly called the "deployment" of the fleet over the world.

The description of the naval fights and skirmishes is stripped of dry technicalities and will interest the lay reader as well as the professional, and yet nothing essential is omitted, from the outpost affair of the *Amphion* and *Königin Luise* in which both vessels were sunk (August 5-6) to the decisive battle of the Falklands (December 8) "which completed the winning of the outer sea."

The physical labor of compiling the material for the history must have been enormous, but the author is clearly what Matthew Arnold used to call architectonic. His logical arrangement of the great train of events which were crowded into those five months with bewildering complexity proves him to be a master-builder in his craft. Moreover he is just and temperate in his analysis, although many of the events he records spelled disaster or disappointment to British arms at sea.

It will not be a matter of surprise to be told that when war came the navy was ready—"the Home Fleets were even in a state of readiness beyond what the War Book provided." Undoubtedly Sir Julian Corbett refers only to the readiness of the individual ships and the organization and discipline of the fleet; otherwise the statement is at variance with the testimony of other competent writers. Mr. Filson Young, who served on

Admiral Beatty's staff, and who is the author of the brilliant book "With Beatty in the North Sea" says "The Navy was ill-equipped for the task it had to perform; its equipment had to be learned and improvised under the immediate peril of war, etc., etc." Lord Haldane in a speech in the House of Lords, May 4, 1921, said, "We do not seem to have thought out the proportion in which destroyers were required to battleships and battle cruisers, nor were we adequately provided with submarines. Our mines were too few, but were relatively speaking, defective."

The *Admiralty War Book* or *War Plans* begun at the instigation of Mr. Asquith in June, 1911, was practically completed at the eleventh hour in June, 1914. It was worked out in great detail. Telegrams by the thousands arranged in order of priority, and letters and instructions in addressed envelopes were prepared for issue. When the time came it required only the pressure of a button to put the war machinery in motion. In spite of all this, however, and that the war plans were made by representatives from the Admiralty, War Office, Home Office, etc., there was according to Lord Esher a "want of co-operation between the navy and the War Office during the first five months."

When war was declared it was a surprise to many that the Grand Fleet and the High Seas Fleet did not make contact at once and fight it out, but notwithstanding the German longing for "the day," the numerical superiority of the British Fleet more than offset the material superiority of the Germans, and both sides realized that there was too much at stake to chance or risk a decisive action in the beginning. It will always be a matter of conjecture, though, why the Germans did not make a determined submarine attack on the inadequately screened fleet at Scapa in the early days. A success at that time would have had great moral effect.

But there was much work for the fleet beside fighting a fleet action. German commerce destroyers were out on the trade routes, and the trade routes were the arteries of the British Empire. Von Spee's squadron somewhere in the Pacific had to be reckoned with and disposed of before attention could be concentrated on the High Seas Fleet; there were insistent demands for coast protection, especially after the East Coast raids; and protection also had to be given to the troop convoys.

Sir Julian Corbett's defense of the Admiralty against criticisms, and his story of how all the complex situations were handled—not without mistakes, of course—by the people in the dim, gloomy corridors at Whitehall, throws much light on the tremendous problems which had to be solved during the autumn of 1914.

Germany's naval problems were simpler but no less difficult. In her isolated position from the sea, she had no access to blue water except by routes barred by British ships. Her colonies were inadequately defended, and she had no advanced bases in the Mediterranean or the Indian

Ocean. Her great asset was the Kiel Canal which gave her command of the Baltic, isolated Russia, and secured her communications with Sweden. It also gave her another entrance to the North Sea.

Before the World War the German Navy had no traditions. Their only sea fight had been the minor engagement between the *Meteor* and *Bouvet* in the war of 1870 off the coast of Cuba. They were gunboats which met by accident in the Bahama Channel; after a few shots both craft broke down and a passing kind-hearted neutral towed them into Havana. The Germans made the most of it, and the affair was commemorated in a large oil painting which was placed in a flamboyant frame and hung in the offices of the Minister of Marine in Berlin. In the period covered by the first volume of the *Official History* the German Navy created traditions, by the exploits of the *Emden, Königsberg,* and *Karlsruhe,* and the two great fights of Von Spee. To its courage and efficiency Sir Julian gives generous testimony.

The *Emden* ran her brilliant and meteoric course in four months. Five days after her loss, we now know that the *Karlsruhe* was blown up off Barbadoes, November 5, but her mysterious end was kept secret and long after she ceased to exist she continued to occupy British cruisers. In the three months of her career she had taken or sunk sixteen British vessels, and one Dutch on British charter, a total of 76,000 tons.

The *Königsberg* was a menace to trade and troop convoys, and served to divert British cruisers and annoy the Admiralty, but actually did little harm, and was finally blockaded the last of October.

In the North Sea there was much activity from the beginning, and the British suffered several disasters. The loss of the three *Cressys,* which occurred within the hour early on September 22, is regarded by the author as "another tragedy added to the useless sacrifices which never cease to darken naval memory," but the splendid conduct of the senior officer present more than half redeems his errors of judgment and disregard of orders.

The end of the year marks the end of Volume I with the defeat of Cradock, and Sturdee's victory. It will not detract from the interest of the book to turn briefly to these two events. Off Coronel the British lost a squadron but gained a tradition. Within a year and a half of the battle, Mr. Balfour in the eulogy he pronounced at Admiral Cradock's memorial said: "What, then, was his design in attacking a force obviously greatly superior to his own; a force which, except by some extraordinary accident, some stroke of unexpected fortune, he could not expect to successfully cope with? Was it that he refused to count the risks? Such deeds of uncalculating daring make our blood tingle within us. Yet there is, after all, a higher wisdom, a higher courage than such daring, and that higher courage I believe Admiral Cradock to have possessed."

At quarter past six in the evening of October 12, four days after it

was sent, the Admiralty received a cable from Admiral Cradock to the effect that indications showed the possibility of the three light cruisers of Von Spee's squadron joining up with the *Scharnhorst* and *Gneisenau,* and that he had ordered the *Canopus* to Falkland Islands, and that he intended to concentrate there.

The First Lord replied at once: "In these circumstances it would be best for the British ships to keep within supporting distance of one another," and also: "They [the German ships] and not the trade are our quarry for the moment. Above all we must not miss them."

The Admiralty in a cable (October 28) countermanded Cradock's orders for the *Defense* on the east coast to join him, and informed him "there is no ship available for the Cape Horn vicinity." It is doubtful if Cradock received this, and at any rate it could not have affected his dispositions.

The Admiralty considered that if Von Spee went north he would meet a superior force of British and Japanese ships, and if he went south he would meet Cradock's concentrated force with the *Canopus.*

The battle of Coronel was an accident. The Germans running south thought they had only the *Glasgow* ahead of them, and Cradock steaming to the northward expected to meet only the detached cruiser *Leipzig.* But at 4:30 P. M., November 1, 1914, the *Glasgow* located the German squadron coming down the coast, and at 6 o'clock the squadrons were in sight of one another, the Germans inshore, and the British silhouetted against the evening sky.

The main action was fought on parallel courses, magnetic south, in a heavy sea and a moderate southwest gale with the light and visibility entirely in favor of the Germans. It lasted only an hour, and night fell on the most decisive defeat ever suffered by the British at sea.

The two squadrons were practically the same tonnage, but the British ships were heavily outgunned by the two heavy German cruisers which carried sixteen 8.2 in all, but only twelve could be used on broadside; opposed to these the British had only two 9.2 guns. Of lighter guns the British had thirty-two 6-inch against the Germans' twelve 5.9.

Unfortunately the British six-inch guns were placed so low down (in the County Class) that they could not be fought in a seaway, a defect which certain American officers discussed with officers of the *Lancaster* and *Monmouth* at Gibraltar when the ships were first commissioned in 1903. In speed the Germans had some advantage, but their great superiority lay in their smartness, and their splendid gunnery which was largely due to their director-system of firing. Besides the *Scharnhorst* had won the gold medal for shooting.

Fire was opened by the Germans at 12,000 range, which had closed to 4,500 when the *Monmouth* was put out of action.

The only possible hope Cradock had for winning the fight unsupported by the *Canopus,* lay in some hidden chance that "as by a stroke of the enchanter's wand," to quote Lord Balfour, he might inflict greater

damage to the enemy than he himself received. That is all that can be said. He had the happy fate of not living to explain.

Admiral Cradock told an American officer at Vera Cruz just before war was declared that if he ever went into action, he intended to follow the ancient custom of his forebears and fight in his cocked hat and epaulets. One wonders if he did. But his tragic end did not call for this dramatic touch. Sir Julian says: "It is not without emotion that one contemplates the feeling of so fine an officer when suddenly he found himself face to face with the hopeless situation into which against all his protests and against his better judgment, he clearly believed himself to have been forced. A cloud that can never be lifted has fallen on one of the most tragic moments in our naval history. All we can ever know is the silver lining. For whatever he thought and felt, Admiral Cradock did not flinch."

His ship went down in the angry sea as the moon rose above the rugged Chilean coast. Tennyson's lines quoted by Lord Escher in his account of Kitcheners death are equally applicable to the passing of this sea Knight:

> "And even then he turned; and more and more
> The moony vapors rolling around the King,
> Who seemed the phantom giant in it,
> Enwound him fold by fold, and made him gray
> And grayer, till himself became a mist,
> . . . . moving ghost-like to his doom."

Disasters had come fast to the British Admiralty which was now "stung into an activity which for reach and completeness had never been equalled in our annals" (p. 369).

Lord Fisher took the helm at the Admiralty, and at once the force of his impetuous character was made manifest. On November 11, Admiral Sturdee flying his flag in the *Invincible* put to sea with the *Inflexible,* his objective being Von Spee's squadron wherever it might be found. After joining up with Admiral Stoddart in the South Atlantic Ocean, he proceeded with the combined forces to the Falkland Islands and arrived at Port Stanley December 7. At once he began coaling, and at the same time allowed the *Bristol* and *Cornwall* to open up their engines.

The *Canopus* had returned to Port Stanley, and had converted herself into an immobile harbor defense by mooring in the mud, her heavy guns commanding the mouth of the harbor.

At 7:50 the next morning the enemy was sighted approaching. The stranger was the *Gneisenau* which Von Spee had sent on ahead to examine the harbor, expecting to find only the *Canopus.* At the startling sight of the tripod masts in the harbor, the *Gneisenau* turned at full speed to report to the admiral what awaited him.

Von Spee might have partially redeemed this mistake of approaching the harbor at the beginning of the day, instead of at the end—the same

mistake made by Captain Müller at Cocos Island—by making a dash for the entrance and forcing a decisive action when the British were the least prepared. But he preferred a stand-up fight in the open sea.

At ten o'clock the British squadron, except the *Bristol,* weighed and stood out. At this time the *Scharnhorst* was thirteen and a half miles to southward steering northward, but changed to nearly due east; at about 10:30 *Gneisenau* rejoined, and both ships continued to parallel the British squadron until 11:22 when they turned to the southeast. Sturdee, "having made up his mind not to press the action," gave the ships' companies time to wash up and "to take the next meal." The weather is variable, treacherous and changes without notice in those latitudes, but God was good to the British admiral. The sea continued calm, the sky blue, and the wind light.

At 12:51 when the range was 16,000 yards the *Inflexible* opened fire. Thereafter the main action continued at varying ranges and such changing of speed and course that the gunnery of the battle cruisers was much impaired. The smoke, too, was very bad.

Von Spee directed his three light cruisers to save themselves and to make for the South American coast, while he and the *Gneisenau* fought it out to the end. Great superiority of speed and gunpower could have decided the action in a few minutes, but the British admiral preferred to maneuver in order to save his ships. He took a chance on the weather, and won. The *Scharnhorst* sank at 4:17, and the *Gneisenau* at 6:02. The *Dresden* escaped, but the *Nürnberg* and *Leipzig* were destroyed by the British light cruisers.

Dauntless courage was displayed by the Germans in this battle, and when their ships went down the English did all that was possible for a brave enemy in rescuing the few survivors of the battle and the icy waters.

Sir Julian shows fine restraint in his comments on the conduct of the "series of chases and actions known as the Battle of the Falklands." He says: "It was in fact as the Germans admitted a fine strategical victory. Tactically it has less claim to distinction owing to the marked superiority of the British squadron, but Admiral Sturdee could claim that by this method of conducting the action he had destroyed a powerful enemy squadron without material injury to two capital ships which it was essential to return to the Grand Fleet with their fighting power intact. The risk of detaching them had been considerable, but the Admiralty by sure judgment accepted it and so had succeeded in bringing to bear at the right time and place an overwhelming superiority of force. It may be said that the fortunate meeting at the Falklands was mainly a point of luck, but it was luck fairly won on Nelson's golden rule of never losing a wind, and in any case those who designed the operation fully deserved all the credit due to plans which obtained so large a measure of success without any diminution of naval strength. What the action meant to the course of the war was that in little more than four months the command of the outer seas had been won; and we were

free to throw practically the whole weight of the navy into the main theater."

Admiral Von Spee has won a place in history with the great sea fighters of all time. He was an accomplished sea officer, skilled to a degree in his profession; he was also a brave and honorable gentleman, who has left behind him a glowing example of devotion to duty and to country for the youth of all nations. An admirable admiral!

"OLD-TIME SHIPS OF SALEM," published in 1922 (second edition) by the Essex Institute, Salem, Mass.

"SALEM VESSELS AND THEIR VOYAGES," a History of the Pepper Trade with the Island of Sumatra, by George Granville Putnam, published in 1922 by the Essex Institute, Salem, Mass.

A Review by Captain Thomas G. Frothingham, U. S. R.

Old Essex County, in Massachusetts, has been notable for its breed of sturdy mariners, who have done so much for the upbuilding of our nation. All history has shown that those who follow the sea develop qualities and characteristics which stimulate the enterprise of their communities. The men of Essex County were no exception to this rule, and in our first struggle for liberty gave proof of its truth, on land as well as on sea. We must never forget that it was Glover's Regiment from Essex County which saved Washington's Army in 1775, when it was apparently hopelessly trapped on Long Island. These seafaring men rose to the emergency and ferried the outnumbered Americans away in the night—to the amazement of the British, who thought that Washington's Army would be their sure prey the next morning. This same amphibious regiment made Washington's surprising campaign in New Jersey possible, by skillfully carrying the American Army across the Delaware through the floating ice.

Salem, in Essex County, held a leading position among American seaports for two hundred years of its history, when the whole life of the town was devoted to commerce over the distant seas. "The enterprise and self-reliance of the merchants and shipmasters of this town eventually opened commercial relations with new and distant peoples living upon the shores of all parts of the known world. It has been said with truth that Salem ships traded 'with more different peoples in Asia, Africa, South America, and the islands of the sea than the ships of all other American ports put together.'"

Most fortunately the records and relics of Salem's maritime history have been preserved in the Essex Institute and Peabody Museum. These valuable collections, from which these two publications of the Essex Institute were compiled, exemplify an American inheritance from the high

seas which is still vital in our nation—as was proved in the emergency of the World War, when the United States Navy again found that Americans still retained their ability to take to the sea.

Salem's early connection with the United States Navy was typical of the spirit of this American seaport. Salem men had done their generous share of the fighting in the American Revolution, and, after independence was won, the town of Salem made an extraordinary contribution to the Navy of our new nation. In *Old-Time Ships of Salem* the *Salem Gazette,* of July 17, 1798, is quoted as follows:

"PATRIOTIC SUBSCRIPTION"

"Last evening a subscription was begun in this town for raising money for the use of the Government, to be applied to the building of vessels, or such other purposes as Government may choose. . . . Neither ability nor patriotism is wanting." On July 24, the *Gazette* adds, "It is expected that the subscription in this town will be applied to the building of a stout frigate." This fund was used to build U. S. S. *Essex,* thirty-two guns, destined to be one of the famous frigates of the United States Navy, in the War of 1812, and the naval cradle of Farragut, whom Porter took with him as a midshipman on the daring cruise of the *Essex* in the Pacific. Lieutenant John Cowell, who had become Porter's ranking lieutenant in the last desperate fight of the *Essex* against the *Phoebe* and *Cherub,* was an Essex County man, and showed the tenacity of the breed by sticking to his duty after his leg had been shot off, dying from loss of blood.

For Salem, no one can dispute the claim that the *Essex* was "a noble effort on the part of a town of ninety-three hundred people." The following extract from an advertisement in the *Gazette* showed the zest of the undertaking: "Let every man in possession of a White Oak Tree feel ambitious to be foremost in hurrying down the timber to Salem, to fill the complement wanting to maintain your rights upon the Seas, and make the name of America respected among the Nations of the World."

The fine picture of the *Essex* in *Old-Time Ships of Salem* is a reproduction of the water color in the Peabody Museum. There are twenty of these beautiful prints in color in this publication of the Essex Institute, and it has been possible to gather them for publication because one of the old Salem banks made it a custom to reproduce one of the historic ship pictures of Salem each year. The result is a most impressive and interesting memorial of the sailing ship era of our maritime history.

These Salem ship pictures are of great value because, first of all, they are faithful portraits. Each was a tribute of the captain to his own pride in his ship, and the result was that a sailorman stood over each artist, and insisted on fidelity to type and rigging. So generous was the purse of the visiting captain that there were skilled artists at many seaports ready for those commissions, of whom the most celebrated were the Roux family of Marseilles. These artists developed an almost uncanny skill in portraying each rope and block—and yet most of these paintings achieved the

The Frigate "Essex," 32 Guns, Built in Salem, 1799

Ship "American," Stephen Webb, Master

presentation of an ensemble that is not merely a diagram of a hull and rigging. Many are attractive pictures in themselves. The Anton Roux water color of the Salem privateer *Grand Turk,* "saluting Marseilles, 1815," is actually a bold and striking composition.

The *Grand Turk* was one of the daring Letter of Marque privately armed ships, which formed another link between Salem shipping and the United States Navy. In both the American Revolution and the War of 1812, the regularly commissioned ships in the United States Navy were of such small force that, outside of service in our Navy, American private enterprise fitted out ships which became efficient auxiliaries of the United States Navy. For the first time privateering was conducted in a way that made it a determining factor in naval warfare, and in both wars the resultant unexpected destruction of British commerce did much to win advantageous peace.

Salem's share in the exploits of the American privateers was what might have been expected of men who had learned to fight upon the seas to protect their commerce. Among the pictures in this book is a very fine one of the Salem private-armed ship *America,* "the largest, the fastest, the most fortunate and the most famous of all the privateers which at any time sailed out of Salem harbor." It is an illustration of the conditions in the commerce of the times, which gave our American seamen their resourcefulness in naval warfare, to read that this Salem ship was launched in 1804 "with port-holes in her sides, and never put to sea without a heavy armament."

Consequently, it was not surprising that it was second nature for the *America* to become a successful privateer. Her "best speed was thirteen knots. She often maintained this rate for hours, and she often averaged more than ten knots for twelve consecutive hours. She was frequently pursued by Spanish and by British cruisers, and she left them with ease." This extraordinary ship was only 108 feet in length, 11.15 feet in draft, and of 331 tons. Yet her total of prizes sent into port, out of forty-seven taken, was "twenty-seven in all of a value of $1,100,000" —a wonderful record, when the scale of values at the time is considered.

Salem Vessels and Their Voyages is a detailed history of the adventurous voyages of Salem ships engaged in the pepper trade with Sumatra. This book is also illustrated with many ship pictures from Salem collections, and there are also many reproductions of portraits of old-time merchants and masters. It is a remarkable gathering of fine types of Americans, and a study of their faces gives the reasons for their successes. And the records of their voyages are proofs that real men were needed to carry on this trade with the Malays.

Constant vigilance was necessary to keep their ships from capture, as the Malays preferred piracy to trade. There were many attacks, and several ships were overpowered and taken. Of these the *Putnam* was abandoned to the Malays only after a hard fight, in which the ship's carpenter did great execution with "a stout stick three feet long, on the end of which the cook had fastened a coffee mill." Probably this was a unique weapon for a seafight, but its construction certainly has merit.

In 1831 the Salem ship *Friendship* was rushed by the Malays, who were allowed to come on board in too great numbers by the first officer in the absence of the captain. Although she was recaptured by the help of other ships, this successful attack, and the large amount of plunder, had such an effect upon the natives in arousing their cupidity that it was necessary to chastise them. Commodore John Downes in U. S. S. *Potomac* did this so thoroughly that Captain Endicott of the *Friendship* afterwards stated, "When I visited the coast again, some five months after this event, I found the deportment of the natives materially changed. There was no longer exhibited arrogance or proud defiance."

The following should also be quoted: "There is preserved in the fireproof addition of the Essex Institute, among its other valuable collections, a broadside which is of interest in connection with the punishment of the Malays by Commodore Downes, as it relates the incidents of that battle. At the top is a picture of a ship under topsails, and beneath is printed the following: 'Battle of Qualah Battoo.' It will be remembered that the ship *Friendship* of Salem, while at Qualah Battoo on the island of Sumatra in the Indian Ocean, was taken by the natives and all hands (five) murdered. When the intelligence was received by the American Government, the U. S. frigate *Potomac,* Captain John Downes, was immediately ordered to that place to chastise them, which was successfully accomplished on the night of the seventh of February, 1832, convincing them that the Stars and Stripes of Uncle Sam are not to be trampled upon, nor the lives of American tars sacrificed with impunity."

A HALF CENTURY OF NAVAL SERVICE, by Rear Admiral Seaton Schroeder, U. S. N. (Retired). D. Appleton and Company, New York.

A Review by Rear Admiral Philip Andrews, U. S. Navy.

Admiral Schroeder's reminiscences are bright and interesting and are a record of naval and scientific services of exceptional variety. There are many incidents of historical interest and value. If more officers of similar length of service could be persuaded to write their experiences, the value of the navy's disinterested service to the nation would be better understood by the people. The book is simply written with a quaint style which is very pleasing; and altogether is full of interest in its record of the development and trial of new ships and new weapons during the development of the new navy. A striking feature of the book is its kindliness in its reference to individuals and to policies, good and bad, during this development.

The accounts of the Korean expedition; the *Virginius* affair; the shipping of the Egyptian obelisk from Alexandria, Egypt, to New York; and the cruise of the sixteen battleships around the world, are all of great interest and historical value.

The final reflections on service matters are fair and present views well worth consideration and discussion. The opinions on the present method

of selection of officers for higher rank are reasonable and offer a possible modification for the future.

Altogether the book presents a record of unselfish service and accomplishment, in which all naval officers may take a just pride; and from which the public may learn how much of himself a naval officer gives to the nation, in valuable service in scientific and diplomatic, as well as in the naval field.

Admiral Schroeder commends to all officers the motto which he has tried to follow: "Whatever you do, do with all your might"—truly good advice.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of life, regular, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become asociate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Asociate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

NOTICE

Naval Institute Prize, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles submitted be typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

C. C. GILL,

Commander, U. S. Navy, Secretary and Treasurer.

TOPICS FOR ARTICLES

Suggested by Request of the Board of Control

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
Shore Duty for Enlisted Men.
The Limits of Specialization in Naval Training.
The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.
Armor or High Speed for Large Surface Vessels?
Airplanes and Submarines Versus Super-Dreadnoughts.
The Navy's Relation to the Nation in World Affairs.

At a meeting of the Board of Control, held 9 August, 1922, a resolution was offered and passed, that, in order to assist the Naval Academy authorities in obtaining a suitable textbook for a new course, the Naval Institute announce

A PRIZE CONTEST

for

AN OUTLINE PLAN

of a

Textbook for midshipmen

on

"HANDLING PERSONNEL"

This contest is open to all competitors, whether members of the Naval Institute or not.

The competition will be judged by the Board of Control and the awards made accordingly.

The first prize will be $200.

A second prize of $150, a third prize of $100, and a fourth prize of $75 will also be awarded, provided that the papers submitted are of character that, in the opinion of the Board, justify these additional prizes.

All papers submitted in this contest must be submitted over the signature of the author and reach the office of the Naval Institute on or before 1 February, 1923.

In judging these awards the criterion will be the usefulness of each paper toward the compilation of the proposed textbook. The *outline plan* should indicate clearly for each chapter its subject matter, scope and manner of treatment. Additional matter in the way of explanatory notes and illustrative examples based on naval experience are wanted and will carry weight in the contest according to their usefulness in the compilation of this proposed textbook to be used in an intensive course for first class midshipmen. A strictly naval book based on successful naval experience is desired.

None of the papers will be published in the PROCEEDINGS but it is understood that the Naval Institute is authorized without further compensation to use material from any or all papers submitted in the production of the proposed book.

C. C. GILL, *Commander,* U. S. N.,
Secretary and Treasurer, U. S. Naval Institute,
Annapolis, Maryland.

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THE RETURN OF THE MAYFLOWER
Depicting the arrival of Captain Taussig's division at Queenstown
A reproduction of the painting by Bernard F. Gribble

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. No. 48, No. 12 DECEMBER, 1922 Whole No. 238

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DESTROYER EXPERIENCES DURING THE GREAT WAR

By Captain J. K. Taussig, U. S. Navy

A dreadful sound is in his ears: in prosperity the destroyer shall come upon him.—(Job, XV, 21)[1]

I. THE FIRST SIX

Being a narrative of the experiences incidental to the crossing of the first United States destroyer division sent abroad for the purpose of operating against the German submarines in the Great War.

At Base 2

The United States Fleet under the command of Admiral Henry T. Mayo, had been assembled at Yorktown, Va., for several days, when, on the evening of April 6, 1917, this signal was flashed from the flagship *Pennsylvania:*

"Mobilize for war in accordance with department confidential mobilization plan of March 21."

[1]This quotation from the Bible was sent to me by Rear Admiral Goodrich, U. S. Navy. I quote from his letter:

"Apropos of your work during the World War, I wonder whether the Hun ever reads or, if he reads, ever heeds the Bible.

These are the words of Eliphaz, the Temanite, (Job XV, 21).

Pass this along among your destroyer colleagues and show it, besides others, to Admiral Sims."

We of the fleet had felt for some time that war was inevitable. When diplomatic relations were severed in February, the fleet was in West Indian waters, carrying on the usual winter maneuvers. The Commander-in-Chief immediately took all necessary precautions to guard against surprise attacks by submarines. Outposts, pickets, and patrols were established. The ships were darkened at night. During the passage to Hampton Roads the fleet proceeded cautiously by an unfrequented route. A screen of destroyers surrounded the big fighting ships. From Hampton Roads it moved up the Chesapeake to the mouth of the York River. Here Base 2 was established.

A boom was thrown across the river; outposts and pickets were posted; a destroyer patrol extending from Eastport to Key West was placed in operation. All these things were purely defensive measures.

There were no evidences of preparations for an offensive movement, and in fact, no such preparations had been made. It was a decidedly discouraging outlook, especially to us in the destroyers. From what little we had heard concerning anti-submarine operations, it was known that the destroyers were the best antidote for the poisoning. It therefore was disheartening to think we were destined for nothing more than to guard our battleships at home and to patrol our coast at a distance of three thousand miles from the scene of active operations. There is nothing more trying and more monotonous than looking for an enemy which is known not to be anywhere around.

My own ship, the *Wadsworth,* had been detailed to make the mail trips between Base 2 and Hampton Roads. This was much better under the circumstances than swinging at anchor as a picket or steaming wildly up and down the coast as a patrol. It was most interesting in that every morning we carried as passengers from Old Point Comfort, one or more officers, some of them old friends, who were on their way to the fleet. There were numerous discussions as to the future employment of the ships. When an opinion was expressed, which was usually the case, it was always to the effect that the fleet would continue as at present—that is, doing nothing in an offensive way. . . . "It was evident that such help as the United States would give the Allies was to be moral and financial. . . . We would send them

munitions but we would not fight. . . . Our fleet was to remain in home waters to guard itself against submarines which were three thousand miles away. . . . Then if the Germans beat the Allies we would be ready to protect the United States . . . . The attitude was a defensive one. . . . It was strategy backwards in that it was division of effort instead of concentration. . . . It was the kind of policy that had lost wars for other nations in the past. . . . If adhered to it would lose us this war" . . . . and so forth and so on.

On the morning of April 13, two of the passengers on the *Wadsworth* were Admiral Mayo and his Chief of Staff, Captain Orton P. Jackson. They were returning from Washington. It did not seem possible that Admiral Mayo was the conveyor of news which was of much moment to the personnel of the destroyer on which he was a passenger. Neither from him nor from Captain Jackson was there the slightest intimation that something unexpected was about to take place.

It so happened that my family were in Norfolk, and, as the *Wadsworth* anchored at Hampton Roads every night, I frequently visited them. On the afternoon of the day when Admiral Mayo returned to Base 2, the *Wadsworth* as usual carried the fleet mail to Hampton Roads; and I, as usual, proceeded to Norfolk. So little of the war spirit had pervaded that place, and so little had we of the Navy felt its pressure, that my plans for the night contemplated attending one of those delightful dances known as the Norfolk German. When about to leave the house shortly after nine o'clock the telephone rang. The automobile was waiting outside. Someone else could answer the phone. We were just starting when the door opened and a voice called:

"Long distance from Old Point for Captain Taussig."

Returning to the house and taking up the receiver I found myself in communication with Lieutenant Falge, one of the officers of the *Wadsworth*. He was talking from the Chamberlin Hotel.

"Captain," he said, "I have news for you. The *Jacob Jones* has just arrived bringing orders for the *Wadsworth* to sail at daylight for New York, to fit out for distant service."

"Have a boat at the dock for me at eleven o'clock," was my reply.

Hanging up the receiver, I returned to the automobile. Instead of going to the ball, I was taken to the Old Point car. The war was a reality after all.

On reaching my ship at midnight and after reading the order, directions were given to be ready to get under way at 5:30 a. m. The order follows:

M-51-30 DESTROYER FORCE, ATLANTIC FLEET,
U.S.S. *Seattle*, Flagship,
13 April, 1917.

CONFIDENTIAL:

From: Commander, Destroyer Force.
To: Commanding Officer, U.S.S. *Wadsworth*.

SUBJECT: Movement orders.

1. The *Wadsworth* is hereby relieved of her present duties in connection with mail. Proceed at daylight, April 14, 1917, to Navy Yard, New York. Dock and expedite all necessary preparations for special service.

2. The *Porter, Davis, Conyngham, McDougal* and *Wainwright* are expected to join you at Cape Henry and proceed on the same duty.

3. Further instructions will be forwarded later.

/s/ ALBERT GLEAVES

The Commanding Officers of the destroyers composing this detail were:

(60) *Wadsworth* ....Commander Joseph K. Taussig.
(59) *Conyngham* ....Commander Alfred W. Johnson.
(58) *Porter* ....Lieutenant-Commander Ward K. Wortman.
(54) *McDougal* ....Lieutenant-Commander Arthur P. Fairfield.
(65) *Davis* ....Lieutenant-Commander Rufus F. Zogbaum.
(62) *Wainwright* ....Lieutenant-Commander Fred H. Poteet.

We, of course, were looked upon with envy by all the other destroyer skippers. Each one of them was dreadfully disappointed at not being among the chosen few. This especially as there was a feeling that maybe these six would be the only ones lucky enough to get abroad. But particularly keen was the disappointment felt by Lieutenant-Commander Wygant and Lieutenant-Commander Bagley. These two destroyer Captains

saw their ships, the *Tucker* and *Jacob Jones,* which belonged to the Eighth Division, displaced by the *McDougal* and *Davis.* It was purely an exigency of war, but it hurt.

The Change in Plans

It is necessary here to digress from the chronological order of happenings in order to relate how the decision was reached to send the destroyers overseas; and how the selection was made. None of the facts were known to me at the time.

From London, Rear Admiral Sims was making urgent appeals to send across immediately all the available destroyers and small craft. These appeals were not heeded. This was undoubtedly because the Navy Department had made no plans for employing our ships offensively, the attitude in Washington being an entirely defensive one.

On or about April 10, Rear Admiral Browning of the British Navy and Rear Admiral Grasset of the French Navy arrived at Hampton Roads on their respective flagships. Here they were met by our Chief of Naval Operations, Admiral Benson, and Admiral Mayo. A conference was held in the Hotel Chamberlin. During the conference there was free and open discussion of the situation. No decisions were reached. The conference adjourned, proceeded to Washington, and on the following day, reconvened in the General Board Room at the Navy Department. Besides the four flag officers who had met the previous day at the Chamberlin, there were at this meeting: the Secretary of the Navy, the Assistant Secretary of the Navy, several members of the General Board, Captain H. B. Wilson, U. S. N., Captain O. P. Jackson, U. S. N., and some members of the staffs of Rear Admiral Browning and Rear Admiral Grasset. The Secretary of the Navy presided. The discussions of the previous day were repeated. Both the British and French Admirals stated the Allies' needs and how in their opinion the United States could best help.

The question of the defense of our own battleships by an adequate number of destroyers seems to have been one of the chief issues. Finally Admiral Browning stated that while he recognized it was necessary that an adequate number of destroyers should be kept with the battleships, still he hoped that the United States would see its way clear at least to show its flag in the anti-

submarine work off the Channel. He pointed out that even *one* destroyer there would have a great moral effect.

Secretary Daniels then turned to Admiral Mayo and said:

"Can we send them one destroyer, Admiral?"

To this the Admiral replied:

"We can send a division and should not send less than that."

The decision to send a division was immediately made.

It has been represented that the British Admiral asked for *only one destroyer.* This of course was not so. His final appeal for at *at least one* in order to have the moral effect of our flag was made only after it became clear that the Navy Department's attitude was adverse to sending any of our vessels from the home coast.

A message was immediately sent to Rear Admiral Albert Gleaves, who was in command of the Destroyer Force, to select six destroyers for this duty. The selection was based entirely on the material readiness and steaming radius of the vessels. The Eighth Division was composed of the newest destroyers, with the exception of a few which had been lately commissioned. It was natural that this division would be in the best material condition. It would have been selected *intact* if it were not for the fact that the *Tucker* and *Jacob Jones,* through no fault of their personnel, did not have the steaming radius of the others. This reason, and no other, was why they were replaced by the *McDougal* and *Davis.*

That I should have been the commander of this division was purely accidental and circumstantial. Captain Hanrahan, who was my senior, commanded the Seventh Division. It so happened, luckily for me, that his ship, the *Cushing,* was undergoing extensive repairs at a Navy Yard. Otherwise, there is no doubt but that to him would have fallen the honor of commanding the first destroyers sent overseas.

Rear Admiral Gleaves recommended that the destroyers fuel and provision at Hampton Roads, and sail for the other side direct from there. This recommendation was approved by Admiral Mayo, but the Department directed that the vessels first proceed to their home yards.

FITTING OUT

The decision to send the destroyers to the other side was made so unexpectedly and the movement started so promptly, it is possibly natural that there should have been considerable confusion connected therewith. This confusion was augmented by the attempts at secrecy which prevented the Department from taking the commander of the small force into its confidence. Consequently there was much working in the dark. At any rate, insofar as I, the commander of the little force, was concerned, the "fog of war" was thick. It was difficult to comprehend just what the Department's wishes and intentions were.

A brief review of our movements and the conditions met with will perhaps show what is meant:

(1) An order received at 9:00 p. m., April 13, directs six destroyers to proceed *at daylight* to New York to fit out for distant service. This, of course, implied haste.

(2) In accordance therewith the destroyers proceeded at 28 knots, arriving at the New York Navy Yard at 6:00 p. m., the same day (Saturday). The yard is closed for work until Monday morning. We find no one even casually interested in us. Apparently there is no haste after all.

(3) The following day (Sunday), the Commandant informs me he received word from Washington that the *McDougal* and *Davis* were due at New York. No mention of the others. However, arrangements are made to begin docking all ships the next morning, four destroyers to be placed in the large dock together.

(4) The Navy Department gets report of arrival of all destroyers at New York. Devil to pay. It was the intention that those whose yards were Boston should have gone to Boston. To Boston they must go, and for Boston we departed the following morning, April 15.

(5) On arrival at Boston we find the Commandant and his assistant ready to help in every way possible. But we are still in the dark as to how long the Department intends it should take to get us ready. There certainly were reasons for sending us to the Navy Yards; otherwise we could have been well on our way across. A conference of commanding officers is held in which it is decided to ask for *every thing* we might possibly need. The list of repairs and alterations is submitted to the navy yard

authorities, and an estimate of ten days given by them to complete the work. This was on Tuesday, April 16.

(6) A telephone message from the Office of the Chief of Operations informs me that the destroyers must be fitted out for any and every service; they must have everything done that they require. *But they must be ready to sail at any time immediately on the receipt of orders.* I felt exactly like the little girl who had permission to go swimming and was told by her mother to, "Hang your clothes on a hickory limb, but don't go near the water."

It seemed to me at the time, and I still feel, that a more reasonable way for the Department to have handled this situation would have been to order the division commander to Washington and to privately explain matters to him. Instead, however, in the endeavor to maintain secrecy, extreme methods were employed, which failed in results. In fact the only way that real secrecy could have been maintained would have been for the destroyers to have quietly sailed from Hampton Roads. By first going to other ports all the personnel connected with the ships knew that something unusual was at hand, that the only thing it could be was that we were going abroad. Undoubtedly everybody at the New York and Boston navy yards knew it or guessed it, as did most of the officers' and men's families. There was considerable telephone communication between Washington and New York and Boston, with stenographers listening-in. Secrecy under these conditions was impossible. The public at large may not have known what was going on, but the secret agents, from whom it was important to keep the knowledge, undoubtedly found out a great deal.

This week at Boston was by far the hardest, most uncomfortable, and most difficult week that fell to my lot during the war. All, or most of which, would have been avoided had the Department taken me, the commander of the force, into its confidence.

Destroyers had never before been sent across the Atlantic except in company with larger ships. There was no doubt as to our ability to cross; but not knowing how our logistic requirements would be attended to, or whether we were going to England, France, the North Sea, or the Mediterranean, or even some place farther on, made it necessary to take on board all the provi-

sions that could be carried, and as much as possible of the spare parts, fittings, and equipment that were usually carried by the destroyer tender.

One could not but marvel at the amount of stuff that was brought down to the dock to be taken on these destroyers. Yet it all disappeared down the various hatches or was stowed on deck. When we finally shoved off each destroyer was displacing approximately 1,400 tons instead of the normal 1,100 for which designed.

The Department had been informed that the Division would sail on April 25. It was the intention to put to sea on that day, orders or no orders as to destination. This was evidently what the Department expected as Lieutenant R. C. Grady, who reported for passage, informed me that he had been instructed by the Chief of Operations to tell me confidentially that the destroyers should sail when ready, and the destination would be sent by radio. On April 22, the Commandant of the Navy Yard received this message headed, "Strictly Secret and Confidential":

Direct Officer No. 324 (J. K. Taussig) special service division of destroyers be ready sail immediately urgent. Report as soon as ready. Destination English Channel.

This narrowed the probable destination to a decided, limited area. Considering the matter since, it has come to me that perhaps the Department did not want the destroyers to sail until the exact destination was specified by Admiral Sims; but if, by the date set by me for departure, no word as to the base had been received, the destroyers should sail anyway.

On April 23, the Department was informed that the division would sail the next day instead of the twenty-fifth as previously reported. It seems that it was also on the twenty-third that the Department received from Admiral Sims a cablegram designating the base to which we were to go. In order that the written orders could reach me, quick action was necessary. On the morning of April 24, two officers appeared at the Boston navy yard. They suddenly had been dispatched from Washington by Federal Express. These officers, Lieutenant-Commander W. W. Galbraith and Lieutenant M. L. Hersey, brought the secret sailing orders, and one copy of a British code book. The envelope containing

the sailing orders was marked "confidential." On opening it I found a second envelope marked "secret and confidential," containing an order which read as follows:

Op-10. NAVY DEPARTMENT,

Office of Naval Operations
Washington
(no date).

To: Commander, Eighth Division, Destroyer Force,
Atlantic Fleet, U.S.S. *Wadsworth,* Flagship.

SUBJECT: Orders.

1. Upon the receipt of the envelope containing sealed orders forwarded herewith, and when your force is in all respects ready for sea, proceed to a position fifty (50) miles east (true) from Cape Cod, Mass., break the seal and carry out the orders enclosed therein.

/s/ V. O. CHASE,[2] Acting.

That same morning the *Davis* and *McDougal* arrived from New York, thus completing the division. At noon a pay officer arrived for duty as the division supply officer. He did not have time to accomplish much in the way of getting his outfit.

We filled to capacity with fuel oil up to the last minute, and, beginning at 4:30 p. m., April 24, the destroyers one at a time cast off and stood down the harbor. Our departure was as unostentatious as if we were going out for drill. There were only a few people on the docks, among them some of our women folks who bravely stood by to the last minute. It was not until weeks later that the press announced American destroyers were operating against the German submarines in the War Zone. This gave the people of the country their first real thrill, and the satisfying feeling that, after all, the United States was doing something besides talk.

THE CROSSING

On clearing Boston harbor the division formed in column, standard speed 15 knots. This would take us to the designated point fifty miles east of Cape Cod shortly after midnight. That seemed a long time to have to wait before we could ascertain our destination. My patience gave out at midnight, the secret envelope was opened, and this is what I read:

[2]Captain V. O. Chase, U. S. Navy, was the Assistant Chief of Operations.

U. S. S. "Davis"

The *Davis* was the newest of the first six destroyers to cross the Atlantic to Queenstown. This picture shows her as she was on sailing from Boston on April 24, 1917. She was commanded by Lieutenant Commander R. F. Zogbaum.

Op-10. NAVY DEPARTMENT

Office of Naval Operations

Washington

(no date).

Secret and Confidential:

To: Commander, Eighth Division, Destroyer Force,
Atlantic Fleet, U.S.S. *Wadsworth,* Flagship.

SUBJECT: Protection of commerce near the coasts of
Great Britain and France.

1. The British Admiralty have requested the co-operation of a division of American destroyers in the protection of commerce near the coasts of Great Britain and France.

2. Your mission is to assist naval operations of Entente Powers in every way possible.

3. Proceed to Queenstown, Ireland. Report to Senior British Naval Officer present and thereafter co-operate fully with the British Navy. Should it be decided that your force act in co-operation with French Naval forces, your mission and method of co-operation under French Admiralty authority remain unchanged.

Route to Queenstown—

Boston to Latitude 50 N–Long. 20 W, to arrive at daybreak,
thence to Latitude 50 N–Long. 12 W,
thence to Queenstown.

When within radio communication of the British Naval Forces off Ireland, call "G C K" and inform the Vice Admiral at Queenstown by British General Code of your position, course and speed. You will be met outside of Queenstown.

4. Base facilities will be furnished by the British Admiralty.

5. Communicate your orders and operations to Rear Admiral Sims at London and be guided by such instructions as he may give you. Make no reports of arrival to Navy Department direct.

/s/ JOSEPHUS DANIELS.

Copy to: C–in–C, Atlantic Fleet.
Comdr. Destr. Force.
C.O. each vessel of division.

That was all. No letter of instructions and no information concerning submarines or how they were operating. We were certainly on our own resources. But I felt pride in the fact that although the Department did not take me into its confidence, it did have enough confidence to leave all details concerning what was to follow to my own initiative.

Prior to sailing, the following order was issued to the division. It was based on such limited knowledge of submarine warfare as had come to my attention:

5-11 SPECIAL SERVICE DIVISION, DESTROYER FORCE,
U.S.S. *Wadsworth*, Flagship
April 24, 1917.

From: Commander Special Service Division.
To: Special Service Division.

SUBJECT: Procedure in case of sighting enemy submarines and in case of damage to vessel of this force by mine or destroyer.

1. If submarine is sighted the vessel sighting it will make six toots on the whistle (in groups of two), open fire and head for the submarine. The next destroyer astern will head in the direction of the submarine on parallel course to the other and assist in the attack. Other vessels will continue on course keeping a lookout for other submarines. Use radio as per C-in-C printed instructions.

2. In case a destroyer of this force is torpedoed or strikes a mine, other vessels will not stop, but will continue on course and make circle of wide radius around damaged vessel until other procedure becomes desirable. Vessels passing close to a disabled vessel will throw life preservers if it appears desirable.

/s/ J. K. TAUSSIG.

This order would have been in different form had I been a War College graduate; and some of the instructions would have been different had I written them a month later. But it gave a basis for mutual protection, and it fulfilled the requirements of the then immediate mission which was not to hunt submarines, but to get across in a condition that permitted of immediate operations.

It was found that while the *McDougal's* cruising engines could maintain 15 knots as a maximum, it was forcing her too much at the excessive draft, and it would have been too uneconomical for her to make the long passage using the main turbines. Consequently, the speed was reduced to 14 knots.

On the afternoon of April 25, the *Conyngham* developed a knock in one of her circulating pumps. It was decided to stop and have it remedied, which was done in two or three hours.

On April 26, the wind started rising from ESE. It increased to half a gale in force and continued so for six days, the storm evidently moving eastward at the same rate as the speed of the ships. Fortunately, the sea was on our beam. If it had been farther ahead we would have had to slow down very materially. As it was, the speed was reduced to 12 knots. This speed was maintained for six days, and very uncomfortable days they were.

All the destroyers rolled excessively in the beam sea. The mess tables could not be spread, and during this period all hands ate off their laps, that is those who ate at all did.

My chief concern was the condensers. It was certain that if we were spared such troubles the passage would be easily accomplished. But if any one of the destroyers developed sufficient leak to spoil her fresh water supply, it would mean considerable delay and the possible necessity of transferring water from one ship to another. The *Wainwright,* during the past winter, had trouble with the condensers, and it was with particular concern that I watched this vessel. On April 30, my fears were realized. A signal from the *Wainwright* announced "condenser leaking badly." This necessitated her stopping in order to locate and remedy the leak.

I could picture the feelings on the *Wainwright,* a feeling of remorse at being the cause of a delay to the division; and at the same time I could picture the men at work down in the hot engine room taking off the condenser heads, working feverishly and rapidly but skilfully and efficiently. There never were more efficient crews than those which sailed in this little flotilla. The personnel, though lacking in quantity, made up in quality. For the past year these destroyers had been hard at work; maneuvers day and night, target practice, and steaming trials. They had all been in competition with one another, and at the time of departure had reached the peak of personnel efficiency. However, it could not be expected that the material condition of the vessels was at the best. This was because we had just completed an unusually strenuous winter, under way continually, with very little time for overhaul. Our departure for overseas was at a time when we should have gone to the Navy Yard for the semi-annual overhaul.

On occasions it has appeared in print, and I have frequently heard it expressed, that the crews of the destroyers were composed of picked officers and men. If this were so, the picking had been done long before we entered the war. The truth of the matter is that the vessels sailed with their regular personnel. As for my own ship, the *Wadsworth,* we had on board the usual peace time complement of five line officers (including the Captain), and ninety-six enlisted men, five of whom were fresh from

the training station. It was not until we had been operating in the war zone for some time that the complements were increased to eight officers and 115 men.

But to return to the *Wainwright*. Knowing how eagerly and rapidly they were working it seemed possible they might not take as much time as desirable to complete the job satisfactorily. So to show that I was not impatient (although I was), a signal was sent to Captain Poteet to "take your time and make a good job of it." In an incredibly short period they had removed the condenser heads, located and repaired the leaks, replaced the heads, and signaled their readiness to proceed.

There were but few incidents that were not usual in such a passage. Of course all the destroyers were darkened at night, a procedure which was routine until after the signing of the Armistice.

One day we suddenly sighted the big White Star Liner *Adriatic*. The visibility was poor and we had undoubtedly seen her before she saw us, as a few minutes later she turned tail and started to run, which she continued to do until our colors were hoisted. At first it seemed rather strange for her to be doubtful as to our identity even if she had no knowledge of American destroyers being in the vicinity. But after a little experience in the War Zone I realized how it was that the destroyers were taken for submarines when first sighted. When visibility was not good, destroyers and other small craft were frequently taken for submarines, even by those who had considerable experience.

On May 2, the wind and sea having gone down, we proceeded with more comfort. As the secret orders directed that we cross the twentieth Meridian at 3:00 A. M., it now became necessary to slow down to even less than 12 knots in order not to arrive there before this time.

I supposed the definite time for crossing this meridian was given so as to assist an escort vessel in making a rendezvous. Sure enough, during the forenoon our radio picked up the first faint calls from H. M. S. *Parthian,* which, we learned later, was a destroyer. She was new, and, therefore, not on our list of vessels.

The *Parthian* requested our position, course, and speed. This was given, and he was informed that we had slowed down in order to cross the designated meridian at 3:00 A. M. in accordance with orders from Washington. On suggestion from him we increased speed to 15 knots. The visibility was poor and the *Parthian* failed to make contact. He radioed that he would steam to the eastward at our speed and on a parallel course so as to join us after daylight in the morning. However, the visibility was again poor and the *Parthian* was not sighted, nor was she seen until after our arrival at Queenstown.

This was the morning of May 3. The sea was now smooth and we were proceeding comfortably when the *Wainwright* again signaled her condenser was leaking badly. It was necessary to stop. During the wait the *Wadsworth* stood by the *Wainwright* while the other four destroyers stood out for five miles on radial lines in the hope of sighting the *Parthian.* But nothing was seen so we continued on our way as soon as the *Wainwright* reported ready.

At about one o'clock the shout of "Sail ho!" was heard. There from out of the haze, standing towards us with a bone in her teeth was a British destroyer. She came along at high speed flying the international signal, "Welcome to the American Colors," to which the *Wadsworth* replied, "Thank you, we are glad of your company," which very inadequately expressed how really glad we were. This destroyer was the *Mary Rose.*

This little episode has been the subject of a picture by a British artist. He calls it "The Meeting of the Fleets." In truth it had a signficance in that it was really the first meeting in war between the outposts of the British and American Navies with the intention of friendly co-operation, instead of hostile action.

The little *Mary Rose* wheeled around and took station on the bow of our formation. The Captain signaled that he would remain with us until arrival at Queenstown. Having heard that vessels in the neighborhood of submarine should zig zag, but having no definite instructions in regard to it, a signal was sent to the *Mary Rose* asking if it was desirable for the destroyers to zig zag. The signalled reply was: "It is safer to zig zag but it is a terrible nuisance." I concluded that any submarine that

sighted seven destroyers proceeding together at fairly high speed would keep clear. So we did not zig zag.

Shortly after the day of our arrival at Queenstown the *Mary Rose* was transferred to a North Sea station. A few months later we received the sad news of the loss of the *Mary Rose,* the gallant little ship going down in battle and taking all hands with her. While escorting a Norwegian convoy, two German raiders made an attack. The *Mary Rose* went for the enemy cruisers in an attempt to protect the convoy. The odds were too many against her and she went down fighting to the last.

There now being no doubt as to all destroyers having sufficient fuel, the speed was increased to 20 knots and we continued thus throughout the night and until the next morning. Then the *Mary Rose* signaled that a message received from the British Vice Admiral at Queenstown directed the destroyers to arrive off Daunt Lightship not prior to 1:30 P. M. in order that arrangements made for taking moving pictures could be carried out. This necessitated slowing down a little.

At the appointed time we were off Daunt Rock light vessel which from a position five miles off shore marks the approach to Queenstown harbor. Here we formed column and with the *Mary Rose* showing the way, steamed past the tug having the moving picture operators on board, past the lightship, and through the swept channel which had just been cleared by the mine sweepers. As we arrived, the ever busy sweepers were still picking up mines which had been laid by a German submarine the night before. Mines had not been laid off Queenstown for several months previously, and it was the first time that they had ever been laid within six feet of the surface. All of which was good evidence that the Germans knew about the sailing of the destroyers, and, if they did not know the destination, they were very good guessers.

At Queenstown

Just before passing between the headlands at the harbor entrance the division was stopped, and a British Naval Officer boarded each vessel to pilot us to our berths. On the *Wadsworth* came Lieutenant Commander Robinson, R.N., and with him were Commander E. R. G. R. Evans, C. B., R.N., Lieutenant Commander (SC) E. C. Tobey and Lieutenant Commander J. V.

Queenstown From a Destroyer at a Buoy

The Royal Cork Yacht Club in the foreground. Admiralty House on the top of the hill shows to the right of the Cathedral.

Babcock of our Navy, and Mr. Sherman, the American Vice Consul. Captain Evans had been detailed as liaison officer on request of Admiral Sims; Lieutenant Commander Tobey was attached to our embassy at London; Lieutenant Commander Babcock belonged to Admiral Sims' staff; and Mr. Sherman came as the representative of the American Consul to welcome us to Queenstown.

We were soon under way again and with the *Mary Rose* still leading stood up the beautiful harbor. This fascinating place later became very familiar to us, as it did also to the thousands of American officers and men who followed and who so frequently sailed in and stood out from that time until after the Armistice. But today was a special occasion. The shore and hills in places were crowded with people gathered to welcome us. There evidently was no secrecy as to our coming in so far as the inhabitants of Queenstown and Cork were concerned. And they made very much more over our arrival than we had thought of.

We passed close to the lighthouse on Roche Point, and on up the harbor between Dogsnose and Ram Point. Then a turn to the right and through the gate in the submarine net, past Spike Island and through the shipping in the outer anchorage. A sharp turn to the left around Bar Rock buoy found us standing close along the Queenstown shore, so close it seemed as if one could almost touch the houses. There was the handsome cathedral of Saint Clomans; and high on the hill overlooking the entire harbor stood Admiralty House with the British Vice Admiral's flag whipping in the breeze. At this time we did not even know the name of the British Vice Admiral; but I know now, without having been told, that Vice Admiral Sir Lewis Bayly was on the roof of Admiralty House, binoculars in hand, watching with critical eye every move of those six little destroyers as they steamed up the harbor. Then there came the long double line of mooring buoys, at one of which was the Light Cruiser *Adventure*, while some of the others were occupied by the patrol vessels, sweepers, destroyers, sloops, trawlers, M. P. boats, etc., which were in port for a short respite from their arduous duties. Between the buoys and the Royal Cork Yacht Club, we passed on up to the Haulbowline dockyard where the *Wadsworth* moored to the oil jetty; her stem almost touching the stern of the little

old *Colleen,* the station ship. The *Conyngham* tied up alongside the *Wadsworth,* while the other four destroyers moored to buoys. The ten day trip was over; fuel oil was already pouring into the tanks of the *Wadsworth* and *Conyngham.*

Had the exigencies demanded, all destroyers could have gone to sea that evening, as soon as fueling was completed. The date was May 4, 1917.

Captain Evans and Lieutenant Commander Babcock upon stepping on board, had each handed me two envelopes. These contained a note from Vice Admiral Sir Lewis Bayly, Commander-in-Chief at Queenstown; a letter from Admiral Sir John Jellicoe, the First Sea Lord of the British Admiralty; an operating order from Rear Admiral Sims who was in London; and a long personal letter from Admiral Sims. In view of the historical interest of these letters they will be reproduced here in full; all excepting the personal letter from Admiral Sims from which only extracts will be given. Admiral Bayly's letter follows:

Admiralty House,
Queenstown,
3. 4. 17

Dear Commander Taussig:

I hope that you and the other five officers in command of the U. S. Destroyers in your flotilla will come and dine here tonight, Friday, at 7:45, and that you and three others will remain to sleep here so as to get a good rest after your long journey. Allow me to welcome you and to thank you for coming.

Yours sincerely,
LEWIS BAYLY.

Dine in undress: no speeches.

This note with its kindly invitation, which of course was accepted, was the forerunner of many other invitations from Admiralty House which came throughout the stay of the Americans at Queenstown. However, I knew of no others that were written. Thereafter all invitations from Admiralty House came by word of mouth or by signal.

I was particularly proud to receive Admiral Jellicoe's letter. I knew him personally, having had the pleasure and pain (both of us were wounded) of serving with him in China in 1900. I could appreciate that now, as First Sea Lord, he was an ex-

tremely busy man to take time for writing to me. The letter is in his own handwriting:

Admiralty, Whitehall
1. 5. 17

My dear Taussig:

I still retain very pleasant and vivid recollections of our association in China, and I am indeed delighted that you should have been selected for the command of the first force which is coming to help us to fight for freedom, humanity, and civilization: we shall all have our work cut out to subdue piracy. My experience in China makes me feel perfectly convinced that the two nations will work in the closest co-operation and I won't flatter you by saying too much about the value of your help. I must say this however. There is no navy in the world that can possibly give us more valuable assistance, and there is no personnel in any navy that will fight better than yours. My China experience tells me this.

If only my dear friend McCalla could have seen this day how glad I should have been.[8]

I must offer you, and all your officers and men, the warmest welcome possible in the name of the British Nation, and the British Admiralty, and add to it every possible good wish personally for yourself.

May every good fortune attend you and speedy victory be with us.

Yours very sincerely,
J. N. JELLICOE.

This certainly was a cordial greeting and one to be proud of as coming from the highest ranking British Officer.

It brought home to me then and there, that the coming of the American Destroyers meant more to the Allies than anybody in the United States could appreciate without having been on or near the scene of conflict.

The operation order issued by Admiral Sims as Commander of the United States Naval Forces was, as can be seen, brief and very general as to detail:

U. S. DESTROYER FORCE,
European Waters,
April 29, 1917.

Operation Order
No. 1.

1. Enemy submarines operating against Allied commerce, in increasing numbers.

[8]The reference here is to Rear Admiral Bowman H. McCalla who as captain of the U. S. S. *Newark* commanded the American Naval contingent of the Relief Expedition during the Boxer uprising in China, in 1900.

2. This force co-operate with, and operate under, direct command Vice Admiral British Forces based on Queenstown.
3. Keep U. S. Destroyer Force Commander informed periodically of military service performed.
   Eliminate all official usual routine correspondence and reports which interfere in any way with efficient military service.
   Give particular heed to physical condition of personnel.
4. In absence of U. S. supply vessels obtain necessary supplies and repairs by direct request on British Headquarters, Queenstown, details and accounting to be arranged upon arrival of supply officer.
5. Forward official mail via British official routes. Use U. S. Service Radio Code for code messages to Force Commander.

WM. S. SIMS,
Rear Admiral, U. S. N.
Commanding U. S. Destroyer Force,
European Waters.

It is not at this time considered expedient to reproduce in full Admiral Sims' personal letter to me. It was one of advice, information, and instructions combined: just such a letter as one would expect Admiral Sims to write to one of his old flotilla captains. And it was one of great value to me as it contained the first authentic news as to existing conditions, with information as to what we were to expect, together with such good wholesome advice that for me cleared the hazy atmosphere as to the proper course of procedure. He wrote in part:

U. S. Embassy,
London, April 29, 1917.

Confidential:

My dear Taussig:

Needless to say your command will receive a most hearty welcome by this country both for sentimental and military reasons, for the submarines are becoming more and more successful with longer daylight and better weather, in spite of all the destroyers and patrol boats the British are able to send against them. In the week ending April 22, they destroyed 237,000 tons of shipping. Manifestly if this is not checked the Allies cannot win.

As soon as I was informed that the Division was coming over, I asked the Admiralty to detail an experienced destroyer commander to meet you at Queenstown and give you and your gang all the points, tricks and stunts, that the British have learned during nearly three years of actual

warfare. You will be supplied with "depth charges" and other appliances now employed, and be informed as to the best known methods of using them. Also as to the various methods that have been tried and found less efficient.

The Officer selected is Commander Evans, who was second in command of the Scott Antarctic Expedition, and was in command of the Torpedo Leader *Broke,* at present repairing the damage she received in the recent (April 20) destroyer fight off Dover. This was a very brilliant night action of two torpedo leaders (1,800 tons) against six German destroyers. Evans' boat torpedoed one and rammed and passed clear over the stern of another. Get the gang all together and make him tell you all about it, for the account contains a great deal of practical information as to the best methods of handling guns and torpedoes, in case you encounter enemy destroyers—which, however, you are not likely to do in the immediate future. He can also give you some very useful points on keeping your men contented while doing work which is necessarily largely monotonous.

I will not attempt to give you the details as he can better do that, but I cannot too strongly impress upon you the essential basis of such night attacks, which is that barring the handling of his boat, the Captain can do little in diverting the details. It is bound to be an affair of minutes, or even seconds, that will depend for its success largely upon the completeness with which the plan is worked out and understood by the personnel. The boat that is organized on the principle that all details are to be directed by the Captain will not succeed. *See that your Captains understand this important military requirement.*

While the above applies more particularly to actions against enemy destroyers, it applies also to actions against submarines. Evans will explain the use of the "depth charges," the most effective weapon against the subs, and from his explanation and the nature and use of the weapon you will recognize the absolute necessity of practically instant action in carrying out a pre-arranged plan of attack.

I have just been placed in command of all U. S. destroyers operating on this side including twelve more destroyers with tenders and auxiliaries to be sent later, but as the active command will of course be exercised by the senior officer on the spot, under orders of the Vice Admiral of the Port, I want to warn you as to certain difficulties that may arise.

Require all officers not only to refrain from all criticism of British methods, manners, and customs, and ask them to refrain from mentioning them in their letters. Also give attention to bringing about friendly relations between our enlisted men and the British. This is very important.

Criticism can do no good; it may do much harm. Let us set a record among the Allies for co-operation and show what can be done in a common cause.

I hope you will be able to shake your gang down and get on the job with as little delay as possible, and thereby make a good first impression,

NOTE:

The report of readiness made by Captain Taussig to Admiral Bayly has become famous. An officer describes the interview as follows:

"I was detailed by Admiral Sims to accompany Captain Geo. E. R. Evans to Queenstown to be present at the reception of our officials by the then Commanding Chief of the British Forces, with headquarters at Queenstown.

"At a reasonable time after the destroyers arrived, the six commanding officers, with Evans, Babcock and myself, proceeded to the Admiral's house. Evans introduced Taussig to Bayly as the Commander of the Division, and when the latter failed to make any reference pleasant or otherwise to the coming of our vessels, I was astounded at his omission to make a gallery play of some sort; and for this reason perhaps, I remember distinctly what he did say, and I have confidence in the belief that my recollection is accurate.

"After acknowledging the introduction, Bayly's first words were these: 'Captain Taussig, at what time will your vessels be ready for sea?' Taussig replied, 'I shall be ready when fueled.' The Admiral then asked, 'Do you require any repairs?' (meaning dockyard work). Taussig answered, 'No sir.' The Admiral's third and last question was, 'Do you require any stores?' (Meaning dry provisions). Taussig answered, 'No sir! Each vessel now has on board sufficient stores to last for seventy days.' The Admiral concluded the interview with these instructions and the observation following, 'You will take four days rest. Good Morning.'

"For years I have had the liveliest admiration for Taussig, but at no time have I admired him as much as at the time of this interview when he met the Admiral point to point.

"After this occurrence I saw a great deal of the Admiral, and about a year and a half ago, I visited him for a week in Devon. I know from what he has said to me on these various occasions that he was as much impressed with Taussig's straight answers as Taussig was impressed by the business-like aspect of the interview."

Editor.

THE FIRST MEETING WITH VICE ADMIRAL SIR LEWIS BAYLY

Right to left: Admiral Bayly, Commander Taussig, Lieutenant Commander Wortman, Mr. Wesley Frost, Lieutenant Commander Fairfield.

which counts for a good deal. To that extent, and perhaps more, you have the reputation of the service in your hands, as far as the British go. Whatever you accomplish is liable to have pretty wide circulation in their service. Paymaster Tobey, who is thoroughly in touch with his end of the game over here, is going over with Evans and will assist you in arranging for supplies, repairs, etc.

I am sure your people will be intensely interested in this work. Of course you and they will understand that it will be no picnic. It will not only be hard but may prove very monotonous. Its success will be largely in keeping the subs below the surface or chasing them away from a certain area.

I may be able to assign you to more interesting work later, as a change if nothing else. In the meantime I am sure I need not warn you not to allow the monotony of the present duty to cause the least relaxation of extreme vigilance, upon which success in such work depends.

I am sending you an operation order specifying the manner in which the operations of your force are to be co-ordinated with those of the British.

I have no doubt that, no matter how arduous the duty may prove to be, you will not only remain cheerful, but will keep all hands the same.

Very sincerely yours,

WM. S. SIMS.

There was considerable more to-do made over our arrival than we had anticipated. It seems that the British placed a decided importance on our coming as an historical event worthy of record. It was for this reason that one of the War Office official photographers was sent from London to take moving pictures of our ships, their personnel, and their doings. And this photographer certainly was on the job. Every place we went that first day the moving picture machine was ahead of us.

The destroyers were all moored before three o'clock. Shortly afterwards the six captains, accompanied by Captain Evans and Lieutenant Commanders Tobey and Babcock were taken in Vice Admiral Bayly's barge to the landing at Queenstown. There we were met by the American Consul, Mr. Wesley Frost, Captain Carpendale, R. N., the flag captain, and several members of Admiral Bayly's staff—among them Commanders Roe and Churchill. I knew nothing of the program, but simply followed where led, rather surprised that so much fuss was being made over these six little destroyers, and always wondering what was coming next. There were automobiles at our disposal, and we invariably rode, even if for only a very short distance. Our first stopping place

was the American Consulate, conveniently situated over a saloon near the landing. On mounting the stairs and entering the office I was somewhat appalled at the gathering awaiting to greet us. The assemblage consisted of the Lord Mayor of Cork, Mr. Butterfield, and about twenty of the leading officials and citizens of Cork and Queenstown. After a round of hand-shaking, champagne was brought in and Mr. Butterfield made a speech of welcome. This certainly was war with a vengeance. I had not contemplated speech making among the "any and every duty that might be required." But of course I had to say something, and am just as well satisfied that I do not now remember what it was.

From the Consulate we were driven up the hill to the entrance gate of Admiralty House. Here we disembarked and walked through the lovely garden to the door where Admiral Bayly awaited us. The Admiral was standing with his back to the moving picture camera which, as usual, was grinding away as we approached. I would have given a good deal to know just what the Admiral's thoughts were. I was presented by Captain Evans, and then immediately introduced the other five captains. In a letter written nearly two years later, in which he thanked me for my share in the presentation, by American naval officers who served with him, of a silver model of one of our destroyers, he wrote ". . . . When you and I first met in May 1917, I think we both wondered how the show would work, but besides that there was such a determination on the part of you and those who came with, and those who followed you, that it should prove a success that there never really was any doubt or question in the matter. . . ."

This official call was of short duration. There was still the call to be made on General St. John who commanded the military forces in the immediate vicinity of Queenstown. The General and his *entourage* were most cordial and it was regretted that we had to cut short our visit. But is was growing late and there was just sufficient time to return to our ships and get ready for dinner at Admiralty House.

During my stay at Queenstown I had the pleasure of dining at Admiralty House many times. However, all the dinners excepting this first one were informal and more or less *en famille*.

The dinner this evening given in honor of the six American Destroyer captains was a formal affair, there being fourteen at table. The only woman present was the Admiral's charming niece, Miss Violet Voysey. Here we met all the higher ranking officers of Admiral Bayly's staff and the officers who were in command of the various departments operating at or from Queenstown as a base.

It felt very good, after being tossed about for ten days at sea, to turn in on the nice big bed in the Admiralty House. We of course received all the attentions for which English hospitality is noted, and the next morning greatly enjoyed the home-like breakfast with Sir Lewis and Miss Voysey. It was served in true English style, that is each one waiting on him or herself. We could not tarry long as there were duties to perform on board ship and there were still official calls which had to be made and returned. In the afternoon we went to Cork going by way of the picturesque River Lee in the Admiral's barge. Here we returned the Lord Mayor's visit and called on General Doran who commanded all the military forces in Southern Ireland. Needless to say we were graciously received at both places. That afternoon we had tea with the American Consul and Mrs. Frost.

It might seem from reading an account of these functions that all our time was taken up with calls and parties, and that the actuality of war was for the time forgotten. But this was not the case. We had plenty of reminders that the submarines were about and that the situation was serious. A converted yacht came in bringing survivors from a torpedoed vessel—an almost daily occurrence. While at dinner at Admiralty House we heard the explosion of one of the mines which the Germans had planted in the hope of bagging one of the destroyers. Before the party broke up, Captain Carpendale left to meet a patrol vessel which was bringing in the survivors of a British sloop, which had been torpedoed, with the loss of the Captain and about forty of the crew. We were told that the lost captain had been one of Admiral Bayly's favorites.

On board the six destroyers all hands were working like beavers preparing for the arduous duties which we knew were before us. The details of this preparation will be left for another chapter. Suffice it to say that we had been in the war zone

but a very few hours before we realized the seriousness of the situation and could appreciate why the authorities were so glad to get re-enforcements even on so small a scale as that represented by the six American destroyers, which to them symbolized "The Return of the Mayflower."

The kindly spirit in which we were received and the cordial manner in which everybody extended greetings, made us feel at home immediately. This undoubtedly had much to do with the perfect co-operation between the British and American Naval forces which began on the day of the arrival of "The First Six," and lasted, with unblemished record, until the last of the American forces quitted Queenstown two years later.

(To be continued)

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE PRACTICAL APPLICATION OF THE PRINCIPLES OF HIGH COMMAND

By Captain Harris Laning, U. S. Navy

During recent years military and naval officers the world over have been devoting more and more of their attention to the principles governing the exercise of command, and many are the books and papers that have been published on the subject. While not a few of the writings are invaluable to those who exercise command, nevertheless practically all of them treat the subject from a theoretical rather than from a practical point of view. However essential theory may be to the development of any art or science, it is not always necessary that he who practices the art be an expert in the *theories* upon which it is based, nor does it follow that one who is a good theorist will for that reason be good in practice. Hence many of the writings on command are not of great help to the practical man in doing the actual work, for having filled his mind with theories, and probably sound theories, he is often at a loss as to how to apply them to his every-day work. It is the belief of the author of this paper that the "practice" of command, like the "practice" of navigation, engineering, or any other activity, can be so described that one can perform it with fair success even though not a great expert in the *theory* of it, and it is the intent of this paper to outline what appears to be a practical method for insuring successful *high command* in naval forces.

So far as the naval service is concerned *command* is of two distinct types. One type, which we may call *low* command, is more generally concerned with controlling men as individuals and in leading them while carrying out the wishes of a superior; the other, which we may call *high* command, concerns itself with controlling the unified efforts of groups of men through directing

the commanders of the groups. Between the two types there is a great, though not always recognized difference. In the former the commander is always a follower who merely carries out the ideas of another, while in the latter the commander is always a leader who *creates the ideas* as well as directs the carrying out of them. It does not follow that a man who is excellent for low command will by virtue of that fact excel in high command, for it is one thing to lead on a way devised and directed by some one else and quite another to devise, direct, and lead the way for all others.

In the Navy the line of demarkation between high command and low command usually lies somewhere *above* the grade of captain. Up to the time he leaves the captains' grade, an officer's work is generally confined to that of low command. Starting with the grade of ensign, each duty of low command naturally prepares one for the next higher duty in that command, and an officer profiting by experience can pass along the line through the grade of captain without finding it absolutely necessary to give much study and thought to the principles of low command. As a subordinate he has no great difficulty in carrying out the duties assigned him, probably having an excellent division, department, or ship. He may or may not have analyzed the principles of low command and applied them to his work, though if he has he is undoubtedly a more efficient officer. Up to the time he leaves the grade of captain, and possibly for some time after, the average intelligent, energetic and conscientious officer exercises command passing well, and it is frequently assumed that when he has done so he has thereby become fitted for the high command that comes with further promotion. Such assumption is utterly unsound and is dangerous in the extreme. While it is practically certain that an officer who fails in low command will hardly excel in high command, it does not follow that mere success in low command proves one's ability for high command. On the contrary there are many men who, under the leadership of efficient *high* command, can obtain excellent results while commanding a ship, a division of ships, or other subordinate unit, but who have not certain altogether different essentials required for high command. It is the purpose of this paper to discuss those essentials and to then point out how they may be developed and applied.

Before starting a discussion of the essentials, attributes, or principles peculiar to high command, it would be well if we could digress long enough to consider those of low command, for there can be no doubt that as far as they go the principles of low command apply also to high command. However, it is not the purpose of this paper to deal with such elementary principles. It is assumed that all officers are more or less well qualified for exercising low command and that all are continuously preparing for the higher task when it comes. Hence for the moment we are not so much concerned with what we *have been* or *now are* as we are concerned with what we *must be and do* if we are to succeed in high command. Most of us are approaching a point in command where we may cease to be the followers of leaders to become the leader of followers, which change is very great and which we must be ready for when it comes. What must one be, what must one do to succeed in this new form of command?

Before we can deduce an answer to our query it is necessary that we have a full understanding as to just what is meant by command. In the *Century Dictionary, command,* as held by persons, is defined as "the right to order, control, or dispose of" and carries with it "the right to be obeyed or to compel obedience." This definition covers the meaning of the word as it is generally understood, but analyzing the definition we cannot but be impressed with the fact that although it states much as to the *rights* possessed by one who commands, it says nothing at all as to the responsibility and duties of a person when he posseses those rights. That command carries with it responsibility and duties as well as rights is evident, but just as they are omitted from the definition they are not always given the consideration they should receive even by those who reach positions of high command. Thoroughly informed of the *rights* that go with command, not all understand or appreciate what such rights impose, yet it is what they impose that is the very essence of success in high command.

It is not difficult to *order, control,* and *dispose of* when one has the power to *compel* obedience, but to do those things in the way to get the best results is an altogether different matter. That they must be done in the one best way in military or naval forces is evident, for unless they are, not only will the forces themselves

pay the price but also the whole state to which they belong will pay it. From this it must be apparent that that which actually constitutes command, viz., "rights," is possibly the least important part of it while that to which no reference is made in the definition, i. e., the responsibility and duties of command, is the very thing on which all success in command rests.

It is much to be regretted that the definition quoted above is so generally accepted, both in the service and out of it, as the full meaning of the word *command*. The idea that a Naval Academy education, a commission, and an officer's uniform, if coupled with a long life in the service in positions of low command, are all that is required for high command is not entirely confined to civilians. All too many naval officers have that idea and seem to think that those things are practically sufficient in themselves to make a man function perfectly in the art of high command. As a matter of fact those things are the most primary and minor elements of high command. Having them, the officer is merely at the starting point. Whether or not he functions properly thereafter depends upon himself.

It has been said that truly great commanders, like Napoleon and Nelson, are born, not made, and there can be no doubt that some men have a natural bent for high command that others have not. However even the greatest in high command, born to it though they may have been, reached their pinnacle only because of their preparation for their tasks. And the same processes must be gone through with by every successful commander. Not one has or will become great through mere intuition and environment, and hence no matter on whom the mantle of high command may fall, it remains for him to fit himself for the work. Were it possible to make the mantle fall only on those who have the natural bent for it, filling positions of high command would be much simplified, for such men would instinctively prepare themselves. As yet, however, we have no means of ascertaining which officers have that bent, hence all who approach the zone of high command must prepare themselves for it even though not foreordained to succeed in it. Each one must so educate himself that he will know what to do and how to do it, and then, having that knowledge, must develop the qualities both in himself and his command, that will enable him to make his forces do the things he wants done, in the way he has decided to do them.

From the above it would appear that there are three fundamentals for success in high command:—*First,* knowledge of exactly what is to be accomplished; *Second,* ability to lay out the certain way to accomplish it with the forces at one's disposal; and *Third,* skill in directing and leading the forces commanded so they will do the thing to be accomplished in the way decided on to do it. If he who holds a position of high command develops these three fundamentals, *knowledge, planning, execution,* his success is certain. Therefore let us see what he must do to develop them.

Up to the time he starts preparing himself for high command, an officer is not compelled to familiarize himself with anything but the immediate tool with which he works, such as the gun, the turret, the engine, the shop, the plant, the ship, or, at most, a small group of ships working as a unit. He comes to know rather definitely, or at least should know if the work of his higher commander has been thorough, just what each tool he has been associated with must accomplish in any situation. Also he has been indoctrinated in the way the tools should be utilized to accomplish it. His work has therefore been rather simple and his responsibility comparatively small. But on taking up the work of high command all this changes. He no longer thinks in small units or operates one or more small units, but must operate many units of many kinds, in a wide range of activities, and solely to attain the end in view in a way determined by himself. While his knowledge of details and the previous training he has had are undoubtedly essential in the new position, by themselves they help him not at all in it. Unless he knows how to combine all the parts of his command into one great machine, and can make that machine do his bidding, he does not function as a high commander. True he may wear the uniform, occupy the position, and assert his "rights;" also he may put up the semblance of a machine; but when the test comes the machine will fail and in its failure bring disaster to itself and to the country that owns it.

Before one can develop a machine for making successful war he must know what such war is. Hence the *first* step toward high command is a study of war—what causes it, what will constitute a decision, and what principles of strategy and tactics should be followed to gain decisions. Such study of war can never end as long as an officer may be called on to exercise high command,

for only by keeping up to date in all things pertaining to war can the officer hope to keep himself ready to wage it successfully. However, when he has progressed to a certain point in his study of the conduct of war, the officer must learn to apply the principles in planning and carrying out successful operations pertaining to war. This is the *second* step in preparation for high command and in this phase the officer must get actual practice through war games. By such practice he learns to correctly estimate situations and reach sound decisions as to the courses of action he should take to win out in any situation, and if such practice is continued he finally becomes expert in drawing up plans that will bring victory in war.

The two steps of preparation just now so briefly outlined can be partly made by taking the courses provided by the War College, but owing to the limitations of the correspondence course, and to the shortness of the regular course, neither step will be complete unless supplemented by constant work along similar lines. Both before and after the War College courses the officer must study and practice war operations, constantly endeavoring to broaden his knowledge and make himself more expert in the conduct of war. But no matter how far he continues such work it is after all only a preliminary to high command. However great one's knowledge of war may be or how remarkable his ability to plan successful operations, he cannot *win* unless he makes his machine carry out his plans. So we now come to the final and most important fundamental of command, *execution*, the practical and successful application of theoretical preparation.

Just as there are many officers who believe that command begins and practically ends with the "rights" of the commander, so there are others who think that it ends when one knows the principles of warfare, and is more or less expert in *planning* war operations. While the latter idea is possibly not so utterly wrong as the former it is still so far wrong that he who believes it is but little better fitted for high command than he who believes the former. Knowledge of war and ability to plan war operations will not by themselves gain decisions in war and this must never be forgotten. Sound plans based on even full knowledge of war bring favorable decisions *only* when they are properly

executed. This being so it behooves us to go deeply into the matter of *execution.*

What must a high commander do to insure that the forces he commands will carry out his plans successfully? Operating on a sound plan, forces *organized* and *indoctrinated* for their task, well *disciplined* through proper *training* in *team work, loyal* and of *high morale* will always win the decision if it is humanly possible to do so in the existing situation. Therefore the answer to our question as to what the commander must do to make his forces succeed seems to lie in (1) Organization, (2) Indoctrination, (3) Discipline, (4) Training, (5) Team Work, (6) Morale, and (7) Loyalty. Let us discuss each of these until we clearly see not only its relation to the execution of plans but also how we may develop it in the forces we command.

Until he is actually given the position, the work an officer does in connection with high command is expended entirely on himself. But when he enters high command and starts to execute, the officer deals with others, many others, who know neither his ideas nor his methods, who are not organized or trained to meet the requirements of *his* plans, and who have little to bind them to him. Yet all of these he must take unto and make a part of himself and his machine. If he is to succeed he can no longer rest content with doing only what he is told to do or what routine requires him to do, but on the contrary must act, act vigorously, and along the right lines deduced by himself. Having no one above to drive him, he must initiate, push, and drive on his own volition until his machine is assembled and in every way ready to fight, for until it is assembled and ready the machine is useless for his purposes, and the high commander has failed in the duty his country implicitly trusts him to perform.

The first step in developing a war machine is to organize it properly to do the work it will be expected to do in war. Such organization is much less difficult to bring about than is generally supposed provided that *efficiency for the task* is made the criterion. Unfortunately, and all too often, those in high command sometimes let other things than fighting efficiency dictate the organization of their forces, and as a result they frequently wind up with commands that can do almost anything but the one thing they are wanted for, fighting. We have had this situation

even in our own Navy and will continue to have it whenever organization is based on anything but the fighting factor. Therefore on coming to a position of high command, the first thing an officer has to do is to make estimates of the situation, ascertain who the probable enemy or enemies are, determine the fighting his command may be called on to do in case of war with them, and then decide on how he will carry on the fight and on his *task organization* to fight that way. This *task organization* for war, derived from those estimates, is the organization a commander should use for his forces, not just during war but during peace as well.

Let us show by instances the practical application of the above method, starting with the Chief of Naval Operations. Upon being made Chief of Naval Operations it becomes the duty of the officer so assigned to take what navy Congress has provided, the Department, the various shore activities, and the forces afloat, and organize them to win any war that is likely to occur. His process for doing this is the same as is gone through by any other commander though in his case he is required by law to draw up the war plans. When he has done that, it then becomes his duty to arrange the whole Navy, including the Department, into such task groups as are called for by the plans he adopts. It takes no law to enable him to do it; it takes merely a strong man who knows what he wants to do and has the force to do it. He may have to upset the Department considerably to do it, but even with laws creating Bureaus as they now are, a very workable organization can be effected. In the same way, by following only his war plan, he can see how to assign ships to fleets and naval districts, and having done that how to organize the shore activities to meet the demands of the fleets and districts. Since Congress has not yet provided all the Navy we will have in war, the organization gotten up by the Chief of Naval Operations to carry out his war plan will in many places be but a shell, and everywhere it will be much smaller in peace than it will in war. Nevertheless such an organization has but to be filled out or expanded to make it completely effective in war and this is as it should be. Shell-like though it be it is the only organization a ready-to-fight navy can possibly have.

Other officers coming into positions of high command, either

in the fleets or in the Department, go through exactly the same process, though when the Chief of Naval Operations has perfected *his* organization it may be unnecessary for them to begin their estimate of the situation where he does. If the Chief of Operations has given them their force and mission their estimate begins with that. But it is carried on to the same end, be the task group commander the Commander-in-Chief of a fleet or a Chief of Bureau. Each decides how he will carry out his mission as set forth for him in the Chief of Naval Operations plan, and decides on the task organization his forces should have to do it. Then he puts his forces into that organization. And so it goes on down the chain of high command even into the realms of low command, until the navy as a whole and every part of it is *organized to fight*.

Even in a most highly developed navy an officer coming into a position of high command would be unlikely to find his command already organized as it must be if it is to carry on in *his* way, and so he must always reorganize it sufficiently to fit his way. It will not do for him to change his way or forsake it merely to meet some one's else organization, for the key of all organization lies in the task to be performed, and under no circumstance should the commander be forced to change his method of performing it. If properly prepared for high command, an officer can quickly organize or reorganize his forces to meet his plans for carrying out his mission by simply dividing them into the task groups he knows he will use in war. Having done that he has the best possible organization for his forces and the only one that will ever work or he will ever need.

The great obstacle to efficient organization in any Navy is the generally prevalent idea that there should be or can be a difference between its peace organization and its war organization. One might as well expect a team organized for baseball to win a football championship as to expect a Navy organized for peace conditions to win in war. If a team thinks and lives baseball it can't do much in football, and a Navy that thinks and lives for peace can never win wars. Yet to a certain extent that is the way in our Navy today, and any one who comes to a place of high command in it, if he hopes to succeed, must bend every energy to-

ward remedying that defect at least in the part of it he comes to command.

Just what causes a Navy or any part of it to continue in an organization based solely on types of ships and peace administration is hard to say, but it would appear to be because those in high command in such a Navy think in terms of peace rather than in terms of fighting. Possibly they know war and can plan war operations, but if so, they fail in the final test of high command for they do not prepare their forces to *execute*. We who are now preparing for high command must not follow that example for even though those who set it may not pay a penalty it does not follow that we also will fail to pay it. Therefore let us resolve that when high command comes to us we will immediately organize our forces for the work they should be ready to perform. It may not be easy to do; it may possibly make peace administration more difficult; and it may even meet with the opposition of some who do not or will not think in fighting terms, yet for all that we must do it for otherwise some of us are doomed to defeat, and our country to disaster.

Having organized his forces for war, a high commander must next indoctrinate them with his ideas and plans for waging it, for no matter how perfectly *organized* forces may be they cannot function as a fighting team unless each part knows exactly what is expected of it. Without indoctrination a huge Navy even when properly organized, is very like an "All American" football team, in which each position is filled by *naming* an exceptionally strong and able player, but which has never been assembled as a team and taught a way to play together. If the eleven men named as the "All American" football team this year were suddenly brought together and started in a game of football against a reasonably strong team, no matter how excellent and how strong the individual players are it would still have but little chance of winning. It would be exactly the same way with a war team. Unless the parts filling the various positions on the war team know exactly what is expected of them in every situation, and know exactly how to do it, they cannot win. Teaching them what to do and how to do it is known as "indoctrination."

Were it possible to carry on war by means of fixed rules, the indoctrination of a Navy, a fleet, or a force, by its commander

might not be absolutely necessary for with such rules one could turn to them and get an approximate idea of his part in any particular operation. However there are no such rules and, for naval forces, there never can be any. No two commanders will ever do exactly the same thing in any of the infinite variety of situations that arise in war and so whenever a high command is taken over by a new commander, even though the old commander has indoctrinated the command with *his* ways, it is still essential that the new commander at once start his indoctrination. And it is especially necessary that he do so in our Navy, for, possibly excepting the battleship force, no part of it is as yet fully organized for its war tasks or indoctrinated with *anyone's* ideas or plans for war. Not fully ready to wage war in accordance with anyone's ideas it is much less ready to wage it in accordance with the ideas of a new commander. Under any circumstance, but especially under circumstances such as still exist to a large extent in our Navy, a new commander must not delay his work of indoctrination. Like organization it is vital.

Indoctrinating the command is one of the longest and hardest parts of the work of a high commander, yet the indoctrination must be thorough. Just how to proceed with it is often confusing and it is to be regretted that many officers, even graduates of the War College, do not understand how it is to be attained. Some seem to think that indoctrination should come from or through the War College, but that can never be for the War College makes no pretence of laying down fixed rules for conducting war. Even after taking the course one officer will have one way of doing a thing and another an entirely different way, both ways being sound and in accordance with the best principles of warfare. The way to be followed by any command is, of course, the way of its commander, hence when indoctrination is attempted it must be done to accord with that commander's plans. If subordinates in the force have had the War College course the commander's work is much simplified, but whether they have had the course or not they must still be indoctrinated. How, then, may we go about doing it?

Subordinates are said to be indoctrinated when they have become so imbued with their commander's ideas that, given a task by the commander, they will execute the task in practically

the same way he would if performing it himself. Therefore the commander must cause his ideas to be absorbed by his subordinates until they actually think and act as he would or as he would want them to. Naturally this cannot come to pass if the commander stays away from his subordinates or keeps his ideas, plans, and methods to himself, so he does just the contrary. He constantly holds conferences with his officers regarding the operation and handling of the forces; he assumes war situations and explains how he wants the command to act in them; he assumes other situations, issues orders for the operations they demand, and causes the orders to be carried out by the subordinates in accordance with ideas he has enunciated to them; he trains his subordinates in order reading and order writing; he teaches them to estimate situations as they apply to their forces, to come to decisions as he would, and then to operate their forces in accordance with those decisions; he makes them realize that in their work all are striving to the same end, and he teaches them co-operation and co-ordination of effort. All these, and many other things, he must do, and he does them not with one officer at a time but with all the heads of the main subdivisions of his force gathered at conferences or games. Doing these things with those immediately under him, he requires them in turn to indoctrinate their subordinates, and so on down the line through the whole chain of command until the whole force works as a unit, united in thought, united in action.

As things are in modern navies, it often happens that neither the high commander nor his subordinates are familiar with all the uses or are well versed in the capabilities and limitations of the various forces and the new types with which they are working. Even in our own case it is often impossible for the "High Commander" to proceed rapidly with his work of indoctrination because neither he nor any one else knows exactly how to handle the new and not fully developed weapons. Even after all his preparation and training he must to a very large extent develop his plans and ideas after working with his forces to learn what they can do. Such procedure has been found necessary in our destroyer forces where the development of destroyer tactics and such indoctrination as is possible in a faulty "type organization" are going on hand in hand. However, in spite of the handi-

cap, indoctrination is going on in those forces just as it should be in every force and in every part of the Navy. But it will never go on *everywhere* until each officer holding a position of high command rises to the occasion and carries out his duty rather than just rest content with exercising his "rights." Not the least important part of that duty is the indocrination of his command.

The next step beyond indoctrination in preparing a command for its task is to make it "well disciplined." Let us get clearly in our minds what is meant by a well disciplined force. Specifically discipline is "training to act in accordance with rules," and forces are disciplined only when they have been so trained that they will always *act* in accordance with the wishes of their commander. In bringing forces to the state where they will always act in the way desired, the training sometimes becomes severe and corrective of faults by punishment, and, because of this, to many officers discipline has come to be so associated with chastisement and punishment that it is thought of only in connection with them. Officers having this idea seem to think that by chastising or punishing subordinates for anything and everything they thereby develop discipline in their command as well as a well disciplined force. That idea is not only entirely erroneous but possibly does more to reduce efficiency than any other one thing. Through forcing men not to do anything at all because they fear punishment if they do anything, it tends to defeat the very thing the high commander wants to accomplish. Discipline is never punishment. On the contrary it is a state or condition brought about not by punishment but by careful painstaking teaching and training on the part of the commander, by which a force becomes able to act in accordance with rules which are the commander's wishes as enunciated and taught by himself. While punishment for failure to so act is sometimes necessary it otherwise has nothing to do with disciplining forces. When constant punishment has to be resorted to it is *prima facie* evidence that the command has not been *trained to act* properly, and the fault lies not with the subordinates but with the commander himself. Not until the commander has taught and instructed his command in his ways, and has trained them *to act* in accordance with them, can he possibly have a well disciplined command.

A high commander must not try to hide his own neglect of duty by punishing his subordinates for not doing the things he has never told them he wants done. He may sometimes, and especially in peace time, evade paying the penalty for his shortcoming by using the power of his position to throw the blame on the helpless subordinate but he will never have a *trained* command. Punishment must be meted out when deserved but it should go to the one who deserves it, and unless he has truly trained his forces to his ways this will frequently be the high commander himself. As a matter of fact in a force trained to act in accordance with its commander's wishes, punishments are few because they are unnecessary. Training, not punishment, makes a disciplined force, and if the officer reaching high command will but bear this in mind and carry out what it implies he will have not only a force that will *act in accordance with his wishes* but one that will do so under *any* condition however impossible that condition may seem.

Since training and not punishment makes a well disciplined force, how may a commander go about such training? We have seen the steps he takes to organize and indoctrinate his force but training goes far beyond that. True, during their indoctrination the higher officers get something akin to training but it is at best only on the game board and is theoretical rather than practical. What the commander now wants is to put theory into practice in exactly the way it will be done in actual war. Obviously to do that is impossible and the nearest approach to it lies in operations that are largely sham. But in sham operations it is not possible to cover every detail of actual war in one grand maneuver, hence it is necessary to take up the various phases part by part and carry out each in a way as nearly like actual war as possible. *Movements,* either strategical or tactical, can be practiced in "fleet maneuvers"; hitting with guns, torpedoes, bombs, etc., can be practiced through actually firing them at targets under conditions similar to those of battle; and other phases can be practiced each in its own way. And so after he has indoctrinated his force a commander must lay out a schedule of practical exercises, by which each and every part of his force gets actual practice at sea in everything it has to do in carrying out the plans for fighting as deduced by the commander. While we can never at one time

hope to practice a force as a whole in all the details of its war operations, we can, by careful planning and taking the phases part by part, give the entire force and every part of it a tremendous amount of practice at sea, and sufficiently like war, to fulfil our requirements. Hence as soon as the commander has given his force sufficient indoctrination to make it know what he wants to do and his general plan for doing it, he must plan and carry out a system of actual practice that leaves no portion of his force untrained or overlooked. Fleet maneuvers covering each phase of the plan, target practice in every form of firing the force will be called on to use in battle, speed trials, economy in steaming, self-upkeep, communication, and every other detail can be *practiced,* and must be practiced over and over, carefully, systematically, and thoroughly until the force not only knows exactly what the commander wants done but *can do it* with precision, certainty, efficiency, and each part in co-ordination with all the rest. For this actual training the high commander alone is responsible, and until he has carried it through his command will never be disciplined or become a fighting team.

In the treatment of our subject up to this point little has been said of the teamwork required in a great fighting force, although in a way teamwork must be considered in every step the high commander takes. His plans for fighting must be based on it, his organization laid out to enable him to put it into effect, his indoctrination such as to make the theory of it known to his forces, and his training work practice his forces in it. In all that an efficient high commander does, *teamwork* exercises a dominating influence, and yet strange to say the principle of teamwork seems to have been lost sight of in recent years by many high naval commanders.

It is possible that the failure of the British fleet to win an immediately decisive victory at Jutland was due to its poor teamwork; in our own Navy if the various elements of the fleet have fully developed teamwork either in themselves or between each other it is not in evidence. Neither in battle, nor in the phases of a campaign that precede it, can any naval force hope to gain success unless its parts are ready and trained to make a tremendous and *co-ordinated* effort, and hence an officer coming to a position of high command, and especially to such a position in our Navy,

must devote great attention to *teamwork*. It is not sufficient to merely base plans in it, to organize forces for it and indoctrinate them in it. Having done all those things and having practiced each part of his force in its own particular task, the high commander must then train the parts *as a whole* in simulated war maneuvers. When he has done that, but not before, his command will be a *fighting team* and naturally no commander worthy of the name can ever rest content until his is a fighting team in fact as well as in theory.

A force organized to carry out its commander's plan, indoctrinated as to the plan and the way of executing it, and trained until it can actually carry the plan through in a perfectly executed co-ordinated effort has gone far in its way to being ready for its great task. Even then, however, it is not sufficiently ready and should a commander stop his work at that point his force will be far from being all it can and should be. Organization, indoctrination, and training, essential though they are, will not by themselves make a force always victorious. Back of those things there must be a greater quality, *a will to win*, and that quality must be so developed that the force will refuse to accept anything but victory. The quality in a force that gives it such a will to win that nothing less than victory will be accepted is known as morale, and it is so vital that unless a command has it to a superlative degree it not only may be defeated but probably *will be*.

Napoleon said "In war the moral is to the physical as three to one," and it is probable that if he erred at all he placed the moral factor too low. Certain it is that material things such as numbers, equipment, and perfection of operation can never bring victory to a force, unless that force is dominated by a will to win that victory. In spite of this self evident truth the training of forces is frequently focussed on giving them the ability to fight while the *will to fight*, which is the far more important element, has been left to look out for itself, and this in face of experience, which shows that even with less actual effort the moral factor can be developed just as surely and just as highly as can the physical. Since the physical factor, no matter how highly developed, is practically useless for war purposes unless glorified by the moral factor, it follows that a commander must develop

that moral factor to the utmost. The question for us then is how he may do so.

When a commander attempts to develop the quality known as morale he is confronted with something very different from the other phases of his task. Whereas organization, indoctrination, training, and teamwork are definite things that require definite action to bring about, morale—the will to win—is a mental attitude, a particular mental attitude, that is so indefinite as to be almost intangible. What goes to make up the particular mental attitude that will not accept defeat under any circumstances, that no matter what the suffering or loss may be still drives on to victory? What may a commander do to develop it?

Morale, for all purposes of war, is a state of faith; it is belief in an ability to see *anything* through to a successful conclusion; it is a measure of men's confidence in their cause, in their leaders, and in themselves. If this be true, we begin to have something definite to work on, for to develop morale it is only necessary to develop that confidence until it is absolute. And a system for that development can be devised by any able commander provided he himself has the measure of confidence he desires to inspire in his subordinates. Much of the work he can do himself and some of it no one can do for him, but a great deal of it can be done by a special organization put in the force for that particular purpose, provided the commander makes himself the *soul* of that organization.

It is impossible to lay out briefly the special organization necessary to develop morale in a force or to explain in a few words how such an organization goes about its task. However, it is unnecessary to do so for in certain books, like Colonel Munson's *The Management of Men,* both an organization and a system for the development of morale are so well explained that any high commander can perfect his own from them. Naturally the high commander should not delay starting the work along that line, but when he has done so he must remember that he still has other things to do to develop morale, and that these other things are *things no one can do for him.* Always his own example must show his confidence; always he must energize the system with the fire of his own faith; and always he must lead. While through his own efforts and those of his morale organization his forces

may develop great confidence in their cause and in themselves, he must never forget that these are but two legs of the tripod that makes morale. The third leg of the tripod is the troops' confidence in their leader, and the structure will fall just as surely from the failure of this leg as from the failure of any other. Hence unless a commander can inspire confidence in himself as a leader he will never have a successful fighting force.

The confidence of a force in its leader is based primarily on the strong personality of the leader himself, and this personality includes ability, devotion, and justice. A truly great leader has little difficulty impressing his ability and devotion on his subordinates. During the organization, indoctrination, and training of the force they have ample opportunity to weigh both, and they will weigh them for exactly what each is worth. Any failure of a high commander to carry out his duty along some such lines as have been discussed in this paper cannot but be known to his force, and though by other ways he may keep their love, their honor, and even their respect, during peace time, when put to the crucial test in war, they are bound to question both his ability and his devotion. When subordinates do that, the will to win in the sense meant in this paper cannot exist. However, even though by his work he clearly impresses both his ability and devotion on his subordinates, a commander who is lacking in justice to them can hardly hope to exact their loyal support when facing trying conditions. Only justice begets loyalty and unless held by the extreme of loyalty men cannot and will not make the supreme effort or the supreme sacrifice called for in war.

Though loyalty is really only one of the many elements that taken together bring high morale, it has such far-reaching effect on morale that it deserves some attention, and especially so since all too often those holding positions of high command do not always understand its principles or apply them to themselves. While in the sense ordinarily used loyalty is devotion to a superior and therefore works upward from the bottom, in the military sense it works both ways and to have its maximum effect there must be loyalty down as well as up. This fact is often overlooked, and we not infrequently see a commander exacting *all* from those under him and giving them little or nothing in return.

In fighting forces one-sided loyalty spells failure, for certainly no commander can expect from his subordinates anything more than he himself gives to them. The commander who fails to support his subordinates when they are faithfully trying to carry out his wishes cannot long count on their maximum support. The commander who in order to avoid punishment for his sins of omission or commission, throws blame on subordinates, has no right to expect, much less demand, devotion to himself. Yet time on time we see these obvious truths violated and find men who should be leading their subordinates to higher standards actually taking a low standard of action in their dealings with subordinates. How different it is for the commander who has the moral courage to stand by and with his subordinates in their hour of need! When his own hour comes they will stand by him to a man and no effort or sacrifice will be too great for them to make when he asks it. Therefore in our preparation for high command and when we come to high command let us not forget that the loyalty of our subordinates to us and all we do will be measured in kind and amount by our own loyalty to them.

There is no better way for a commander to show his loyalty to his subordinates than by having faith in them to carry out any task he assigns. It is to warrant such faith that commanders go to such great lengths to indoctrinate and train their commands, yet it often happens that even after they have done so they nullify their work either by taking charge of a subordinate's task or by including in orders detailed instructions for carrying it out. Showing, as it does, a lack of faith, such action is fatal to results and if persisted in not only reacts in the subordinate's loyalty to his commander, but also tends to destroy his initiative, the very thing on which a commander must rely when not in personal contact with the subordinate. When a subordinate knows his commander depends on him to carry through successfully his part in the general plan, in the way that seems best to him as the man on the spot, he will spare neither energy nor resources in doing so as long as there is life in him. This is exactly the spirit and will to win that the commander wants and must cultivate; but it never comes to a force whose commander tries to do anyone's work but his own. For this reason, if for no other, high commanders must leave all details of execution to their sub-

ordinates. Nevertheless there is another and quite as important reason for doing so.

Whenever a high commander usurps the province of a subordinate he does more than kill initiative and destroy morale, he puts himself in a position in which he cannot but neglect his own great task. From what has gone before it is evident that in attending to his own important duties a high commander has quite all the work any man can do and that if he undertakes the work of another he can do so only at the expense of the time he needs for his own. Furthermore, in doing it he sacrifices the *whole force* to a part, and even the part becomes worse off than it otherwise would be because it is trained solely to operate alone. We see an instance of this when a Commander-in-Chief takes personal charge of say his battleship force, and personally supervises all it does while giving little or no attention to the rest of the fleet. Because that task keeps him very busy he may feel he is doing all he can do and his full duty. On the contrary he is doing nothing that he should do and is actually *neglecting* his duty. No matter how perfect the co-ordination of battleships may become between themselves it will serve no purpose in war unless the battleships *as a group* co-ordinate with those of the other parts of the *battle fleet*. Even a perfectly trained *battle fleet* will be of little value in war if it cannot co-ordinate its efforts with those of the other forces that have to lead it to battle. This being true it becomes nothing short of fatal when a Commander-in-Chief concentrates his energies on only one part of his force, for he stands not only to get nothing from his fleet as a team, but also to get the absolute minimum from the part he concentrates on.

In the same way that a Commander-in-Chief often fails through usurping the work that belongs to subordinates so will any other high commander fail who does likewise. Yet over and over we find high commanders doing that very thing. They swamp themselves in details belonging to subordinates, and because they overwork themselves in doing so they imagine they are making progress even though they never give a thought to their own great task. Success in high command is never measured by the *quantity* of work done by the commander but only by the work he does on his own particular task, and high commanders should not

delude themselves on that point. To do so is absolute proof of incompetency and unfitness for the task. If a high commander cannot from his mission deduce his own task he certainly is not fitted for command. Neither is he fitted for it unless he sticks to that task, and to no other. In these two statements we have the very foundations of all success in high command—knowing one's own business and attending to it. When the high commander does that he does all, but the trouble is that many high commanders do not do it. Those who aspire to such positions should avoid the pitfall, but if they do it will be by their own efforts for there is no one else to point them fair.

What one must be and what one must do to succeed in high command is now before us. Even from this brief discussion it must be evident that he on whom the mantle of high command may fall has a responsibility and a duty he cannot evade without wilfully exposing himself, his command, and his country to disaster. While those in position of low command always have over them a higher commander who is competent to judge, and who does judge and pass on their work, the high commander has no such superior and if he so elects he can often leave undone those things he should do without himself paying any penalty for it. During war, should he then be in command, his country of course will judge him by the results he gets. But war may not come during his time in command, so even though the evil of his way lives after him he may not be held responsible for it. Ordinarily during times of peace the sole judge of a high commander's work is his own conscience, and if he chooses to salve that it is probable that no power superior to him will either question or doubt anything he does or does not do. During such times, though he has utterly failed to prepare his force for war, it is even possible a high commander may be considered a successful one for at that time, at least outside the Navy, no one knows or seems to care about the Navy's readiness to fight. But can we as naval officers neglect our duty simply because of that? Are any of us so deficient in moral obligation and sense of duty that we are willing to turn over to a successor a command which if war comes might bring odium on him and disaster to the country? Let us hope not, but at the same time let us not forget that our own Navy is not today either a fully organized or highly trained

fighting team. Were the way to make it a fighting team obscure, were there any doubt as to exactly what course a high commander should take to make it one, there might be some excuse for our not making it ready and keeping it so. But with the way so clear there certainly cannot be. Knowing that way, an officer worthy of the uniform he wears and of the trust his country has placed in him cannot and will not spare either himself or his efforts in following it.

Truly the principles of high command are embodied in the trinity—self preparation, planning, and execution—each of which follows the other in turn and none of which is of value without the others. Of these the first two concern themselves only with the high commander, but the last concerns itself with the entire command and is the measure of all that command does. No matter how well the commander may prepare himself, no matter how expert he may become in planning, those things go for naught unless he *organizes* his command to carry out his plan, *indoctrinates* it with the plan and method of carrying it out, *trains* it so it will act in co-ordinated effort in accordance with the indoctrination, and finally develops in it the *"fighting spirit"* and the *"will to win."* These are the things the high commander can do and must do. And they are the things he will do if he too has the *fighting* spirit and the "will to win."

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE LETTERS OF A RETIRED REAR ADMIRAL TO HIS SON IN THE NAVY

By Rear Admiral A. P. Niblack, U. S. N.

Letter No. 10.

TANGIER, "THE INTERNATIONAL WAIF."

"Hope Farm,"
Long Island, N. J.,
November 1, 1922.

Dear Son:

I am glad you are getting a little gunboating in the Mediterranean. To be sure you are in a destroyer, but most of the cruising done by destroyers away from the fleet is merely gunboating. This is because we are getting to be a real power in the world and have not enough gunboats and cruisers to keep up with our international peace obligations, requiring us to use destroyers instead, and a good thing too it is. They are well adapted to showing the flag as every one of them costs over $1,000,000, which you only have to go aboard to see why. When the average foreigner learns we have over 300 of them, exactly alike, it has a tendency to make him sit up. Then, too, it is not so expensive in personnel to have a destroyer do diplomatic work, and, with most of our cruisers and gunboats in the banana squadron, it helps make good on recruiting posters which invite young men to see the world through an air port.

Your description of Tangier amuses me. It is not the old Tangier because it is slowly starving to death commercially. You complain of the danger of landing there. Some day there will be a breakwater, but not yet because the Powers cannot agree even on letting a private company build one. The prospect for the moment, however, seems that they may at least agree on that much. Curiously enough there was a small breakwater or mole

there built by the British about 1664 during their occupation, but which was very laboriously destroyed by them when they unfortunately withdrew from Tangier in 1684 for reasons of economy. International jealousies have now very nearly strangled the life out of this international waif. It is tragic but has its cynical side.

The average American is puzzled by European diplomacy because he sees the various complications in Europe without knowing the secret intrigues which have brought them about. It requires an expert to sit in a game where secret understandings make all agreements reached as eventually futile as the secret understandings themselves.

A short time ago one of our cruisers visited Tangier and very properly saluted the port with the flag of Morocco at the main. Calls were made on the Sultan's representatives on shore and the usual other courtesies complied with. On arrival, the boarding officer from a cruiser of one of the Powers came on board and extended a "Welcome to Our City" in so many words. Now it is an amusing fact that with all the various aspirants to take Tangier away from the Sultan of Morocco through agreement of the Powers, by either giving it to some one Power or really internationalizing it, the United States has just as much right to a say in the matter as any other Power, as we have been thoroughly mixed up in this question from the very start. Yet we are so immodestly not claiming anything from Europe on account of the war (except, perhaps, the re-payment of money belonging to American taxpayers which our Government kindly loaned abroad to other governments as if it was really its own money) and we are so timidly flirting with Europe without apparently any intentions, that we are actually encouraging Europe to ignore us in our real international interests and to call upon us only to sweep up after their messes and to feed their starving women, children, old men and even young ones, due to international situations which we had no hand in creating.

As to a breakwater for Tangier, when a commercial company, backed by the French Government, recently got a concession from the Sultan to build a breakwater and execute much-needed harbor works, the British and Spanish interests were up in arms because of the overwhelming preponderance of French capital in the scheme. We have just as much right to share financially in the

creation of a free port at Tangier as any one else and also to participate in international committees to govern the port. Our Shipping Board certainly ought to have the opportunity to share in the advantages of this port without our being accused of mixing up in European affairs, for the "Algeçiras Pact" still holds as far as we are concerned. If ever a port is constructed at Tangier, the next step will be for passenger cars and freight trains to be ferried across from Spain to connect by railroad with Dakahr, thus shortening the route from Europe to Rio de Janeiro and Buenos Ayres by some ten days. As Europe is now much nearer to South America than we are this would place us at a still greater disadvantage. Of course Great Britain will never consent to a great commercial port being built at Tangier unless guaranteed of its neutrality in case of war because of its proximity to Gibraltar, just across the Strait, and with modern aviation and submarines so close to the entrance to the Mediterranean and on the route to India.

You know we have a Consul General at Tangier who is also the Diplomatic Agent. You speak of the recent surrender of Raisuli, the Moroccan bandit who has held forth so long in Northern Morocco. I remember very well in 1904 when he captured Perdicaris, who was living just outside of Tangier, and got himself in the newspapers by demanding $40,000 ransom. That was very slick of Raisuli. He had not reckoned with President Roosevelt, who sent a squadron to Tangier and on June 22, 1904, sent a telegram to the Sultan of Morocco demanding "Perdicaris alive or Raisuli dead." As the Republican Convention happened to be in session at the time and Mr. Roosevelt was nominated for a second term, you may be interested to know, as a by-product, that Perdicaris was released but not until the Sultan of Morocco had paid the $40,000. However, no person in Northern Morocco was in good standing unless captured by Raisuli and ransomed. It was a good deal like having appendicitis. It showed you were rich enough to afford the operation. To me, one of the most curious phases of the whole question was that the Flag Officer in our navy who went to Tangier in the flagship *New York* on that occasion got his first real insight into European intrigues, which profoundly influenced his career afterwards. A great many other Americans got their ideas of Morocco from this incident. But

where we really got interested and tied up with Morocco was in the Madrid Convention, in 1880, to which we sent delegates. Nearly every country had made commercial treaties with the Sultan of Morocco, leading to great inequalities as to international privileges, and the Convention effected mutual agreements as to equitable trade relations by which all countries were placed on an equal footing, and certain abuses of international privileges were to be corrected. It is a curious fact that today Great Britain and the United States are the only two countries which have not renounced the capitulations of the early treaties with regard to the rights of our citizens in Morocco. Immediately subsequent to the Madrid Conference an international agreement was added to the Convention with regard to the status of Tangier as an international port, and we were a party to it.

Of course, you have found Tangier delightful socially and you have played tennis and golf and gone to dances, for there is a charming European colony there and the diplomatic corps is extremely active. It reminds me of an eddy inshore of a strong current. It spins around rapidly but does not get anywhere, as there is no solution to the Tangier problem unless we cut it with an axe. While you may be fascinated with the roulette wheel and the good-looking young ladies, I think that the most fascinating chapter in recent diplomatic history has been the acquisition by France of its Protectorate over French Morocco. You are, of course, too young to be interested in history and I do not want to bore you, but at the beginning of this new century, France, through her colonial ventures in Madagascar, Cambodia, Algeria and Tunisia, had come to realize the special value of Morocco. Delcassé, the French Minister of Foreign Affairs, in 1901-2, quietly began the acquisition of French Morocco by negotiating for a secret understanding with Spain. Great Britain, however, was too alert and brought both France and Spain to her own terms, which were somewhat as follows:

What France wanted was a free hand in Morocco, but before she could come to an understanding with Spain she had to satisfy Great Britain, so, on April 8, 1904, the numerous outstanding differences between France and Great Britain, in various parts of the world, Newfoundland, Senegambia, Siam, Madagascar, New Hebrides, Morocco, and Egypt, were simultaneously settled by a

series of special diplomatic agreements. The two governments, "equally attached to the principle of freedom of commerce in Egypt and Morocco," agreed to maintain economic equality in both countries, but there were to be no fortifications of the coast of Morocco west of Melilla. It was on these conditions that France entered the Entente. The agreement pledged both governments not to alter the status of Morocco—but (1) France was to make a special treaty with Spain, and (2) secret articles were signed which provided, in case of the destruction of Morocco's independence, Spain and *not France* should get the territory bordering on the Mediterranean and Atlantic entrance thereto. This secret clause was not published until November, 1911. This Anglo-French Declaration was signed on April 8, and shortly afterward, October 3, 1904, a Franco-Spanish Declaration was signed, in which both governments remained "firmly attached to the integrity of Morocco," but secret articles arranged for its partition along the lines provided in the Anglo-French Declaration. Thus for its relief from French incubus in Egypt and other sources of friction, England paid France with something she did not own in Morocco, and secured thereby the real point of importance, viz., that France should be excluded from the Mediterranean and North Atlantic Coast of Morocco about the Straits of Gibraltar in favor of the weaker power, Spain.

On March 31, 1905, the German Emperor spent two hours ashore at Tangier, Morocco, and by a few remarks brought on the Conference of the Powers at Algeçiras, whose declarations were signed April 7, 1906, the United States being a signatory power. By this the nationality of Morocco was to remain intact, and all the Powers were to be on an equal footing, while Tangier was to be internationalized, and joint arrangements were made for police, finances, public works, and the joint development of Morocco by the Powers. England, Spain and France, during the Conference, knew of the secret agreements, but certainly neither Germany nor the United States did. These agreements, in effect, nullified the pact of Algeçiras, because both England and Spain secretly recognized France's dominant interests in Morocco, but pretended to agree to internationalization. In other words, we sat in a poker game with the cards stacked against us.

France has now, as we all know, established a protectorate over Morocco. The Franco-Spanish treaty of November 27, 1912, following a treaty which Germany practically forced on France on November 4, 1911 (which I will tell you about sometime), has caused active diplomatic friction between France and Spain, complicated by the fact that, in 1914, France, Great Britain and Spain drafted an agreement allotting to each nation that part of the government of the city each one was to undertake. The war came on and the agreement was not signed. This has tied things in a hard knot. France wants Tangier under her protection. By royal decree the King of Spain, in 1920, has affirmed that Tangier is assimilated with the Spanish-Moroccan ports of Cueta and Melilla, with the privileges of exports under existing treaties. Spain does not admit that Tangier has ever been under the authority of the Sultan of Morocco as "protected" by France. Great Britain does not propose to have any one Power build up a port at Tangier. Meanwhile the diplomatic corps at Tangier revolves dizzily on its own axis and gets nowhere. One minute Tangier is to be French, then Spanish, then England appears to intervene, and America is appealed to on account of having been a party to all the agreements. Spanish reverses in Morocco have further complicated the question. The amusing thing about the whole situation is that no one has ever suggested that the various treaties in connection with the port of Tangier be carried out. Diplomacy has almost reached that stage that the law has in the United States. No sooner is a law passed or an agreement made than everyone gets busy to see how they can beat it. That is the reason why we have so many lawyers in the United States and so many diplomats in Europe. No wonder we get the reputation for "shirt sleeve" diplomacy when we get so often done in the eye from the scraps of paper flying about.

Meanwhile it is interesting in Tangier to see the city recognizing the authority of the Sultan of Morocco, with Moorish, French and Spanish police and British, French and Spanish post offices, banks, hotels, cafes, shops, etc. Only the gambling houses are international. It is not improbable that the next generation will witness the construction of a tunnel under the Straits of Gibraltar in the vicinity of Tarifa, Spain, on one side and Tangier on the other. An amusing feature of this will be the custom house at

Tarifa. The word "tariff" comes from the tribute levied at Tarifa on traffic in the Straits of Gibraltar by the pirates of Tarifa. From the language used at our custom house by ladies I should judge the duties are still regarded as piratical.

By what I have said you will gather that we have the same rights and interests in Tangier as any other Power if we choose to exercise them. We have not renounced the capitulations in Morocco nor any of the treaties in which we have participated. We are in a position to drive any bargain we may choose to make which will safeguard our legitimate interests. In renouncing all compensations for our share in the war we have created the impression in the world that we have no rights, and only the privilege of helping. If we are afraid of Tangier as involving us in European affairs, let us consider it an African question with something to do about Liberia. Of course what I have said may seem to reflect somehow on somebody but it is like the man who said to another, "I did not say you took my golf ball. I only said I would have had a better chance of finding it if you had not helped me look for it."

Affectionately,

Dad.

(To be continued)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TRUE MEANING OF THE PHRASE "AN OFFICER AND A GENTLEMAN"

By Lieutenant (j. g.) H. E. Dow, U. S. N. R. F.

An officer is, from his position, a leader of men. He must show in himself such qualities as he desires to bring out in those under his leadership. A gentleman is exactly what the word signifies, a gentle man.

In the *Articles for the Government of the Navy* are found the following words:–

> The commanders of all fleets, squadrons, naval stations, and vessels belonging to the navy are required to show in themselves a good example of virtue, honor, patriotism, and subordination.

The possession of these four fundamental, as they may be called, qualities will produce neither an officer nor a gentleman in the fullest sense of the words. To them must be added initiative, ambition, loyalty, good judgment, and justice, together with a certain human kindness all cemented with an unfailing sense of courtesy and tact.

Virtue signifies courage or bravery, but not foolhardiness. There is no person more universally respected among men than he, who, having calmly figured the risk and counted the cost, proceeds with full knowledge of the danger involved to carry out his appointed duty quietly and confidently. It may be said that virtue is, in this sense, the bed rock of the character of a leader of men.

Resting closely on this foundation of virtue must be the corner stone of honor. Honor implies a high sense of duty, a scrupulous faithfulness to any trust involved, a thoughtlessness of personal advantage or disadvantage. An honorable man is one deemed worthy of honor by his associates, whether they be super-

ior or subordinate, and to be so deemed worthy means that a man must be brave and faithful in the performance of his duty and honest and sincere, not only with others, but with himself.

Patriotism is communal loyalty. A man's loyalty to his God comes first, his loyalty to his country next, for to his country, under God, he owes everything that he is, or has, and therefore for his country he must stand ready to sacrifice everything should need arise. True patriotism does not mean the fiery, flag waving, do-or-die-at-once mob spirit that rises so swiftly and burns so fiercely in times of real or imaginary national peril, and then dies to indifference as rapidly as it rose; it means steady, unswerving devotion to country that is not discouraged by indifference and neglect, that is willing to work steadfastly for the ultimate good of the country with those materials at hand, whatever they may be, and in so doing to inspire others with the same spirit.

Subordination may be said to mean military co-operation. A man's ability to subordinate his own wishes and desires, to throw himself with whole hearted co-operation into the carrying out of the plans of his superiors, has a wide and invigorating effect on all who come in contact with him. Men admire the officer or man who, with absolute self forgetfulness, drives on for the good of the whole, cheerfully taking his place as a cog in the great machine of military organization however unimportant the duty he may be called on to perform.

Initiative means the possession of the power to begin or undertake independently. No man is worthy to be an officer who is unable to act swiftly on his own responsibility when the need arises. The ability to make a correct, intelligent estimate of the situation confronting him, and, having made the estimate, to decide upon the right course of action is not enough. Having estimated and decided, he must be able to initiate the proceedings called for and carry them through to their logical conclusion with firmness and determination.

Loyalty should need no definition. Loyalty to the navy, the ship, the captain, the officers, the men, must be so ingrained as to be instinctive. The finest thing about it is that loyalty breeds loyalty. The bread of loyalty cast on the waters of daily work returns a hundred fold and an officer known to be loyal to his service, his superiors, his ship and his men is not a single man, he is a host, for when the pinch comes he will not stand alone,

but whole-heartedly supported by his comrades, and will not be found wanting.

Every man is endowed with a certain amount of common sense that may be developed by constant use. Not a situation arises in work or play that does not call for the exercise of this quality. A man who always seeks the best, which is always the common sense way, of doing whatever tasks are assigned him, will, when he meets emergencies, be said to exercise good judgment. After all, good judgment is only glorified common sense.

Ambition is the purpose to advance. No man who has not the will to push forward and improve himself mentally, morally and physically can ever hope to lead others upward. It is a truism that what does not advance must retrograde. There is no such thing as standing still.

Justice means fairness in praise or censure, equality in the assignment of tasks, reason in demands on subordinates, willingness to give credit where credit is due, even though it brings blame to the officer or man giving that credit. A just man is a man four square, not only with himself, but with the world.

Human kindness is intangible, it is the salt that leavens the whole loaf. Sifted down it means insight and foresight to relieve the cares of those weighted with heavy responsibility, to temper justice with mercy towards subordinates, to extend always the guiding and helping hand to those in need.

A man, gentle, unafraid in the face of danger, courteous always without condescension or servility, tactful, honorable in all his relations with mankind, patriotic, subordinate, an example to all about him of initiative, ambition, loyalty, good judgment, justice, and kindness; such a one fulfills in its highest sense, the true meaning of the phrase, "An Officer and a Gentleman."

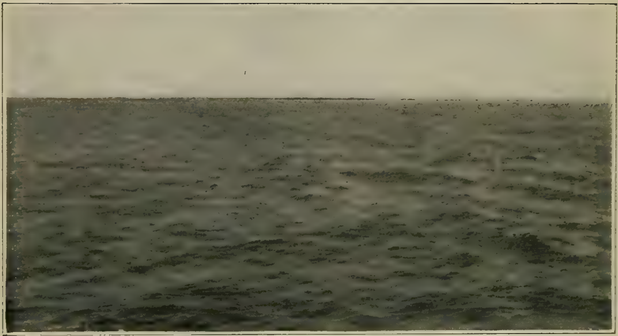


Photo by Chaplain McCarthy

Wake Island from a Distance of Two Miles

Vessels of the U. S. Mine Force Engaged in Laying the North Sea Mine Barrage

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

WAKE ISLAND

By Lieutenant Commander Sherwood Picking, U. S. Navy

On a recent passage the U. S. S. *Beaver* passed close aboard Wake Island, and as the sea was smooth, and we were in need of boat drill, it was decided to heave to and send a party ashore for a few hours. Although only a few hours were spent, a considerable amount of information was obtained which may be of interest to the Service.

Wake Island lies about twenty-five miles to the northward of the Great Circle course between Guam and Honolulu, and 1,334 miles to the eastward of Guam. There is no mention of it in the index of the sailing directions and a diligent search was necessary before a brief paragraph was discovered concealed at the end of the Marshall Island Chapter. The only chart of Wake is a plan printed on the sheet with Vatoa and Murea in the Society Islands and in South Latitude, so that this also had to be searched for.

Wake Island was discovered in 1796, and its position was fixed by the U. S. Exploring Expedition, better known as the Wilkes Expedition, in 1841. The chart gives this expedition as its authority but a search of the records shows that only a few hours were spent on shore, so the survey was probably merely a hasty plan drawn from the masthead. The island was taken possession of by the United States on January 17, 1900.

Wake is of interest by reason of its extreme isolation; over 300 miles from the nearest land, and that only another atoll; but especially because of its location on the route between Hawaii and our Asiatic Stations. The longest single leg between the Continental United States and Manila is that between Hawaii and Guam. This stretch of 3,337 miles is without a good harbor and, although well within the radius of capital ships, makes a trying and perhaps impossible voyage for small craft. That the

larger submarines can make this non-stop run was shown by the *S*-boats in November, 1921, but for smaller submarines and especially for anti-submarine and aircraft, it would be a most trying trip. It would be of great advantage could this voyage be broken.

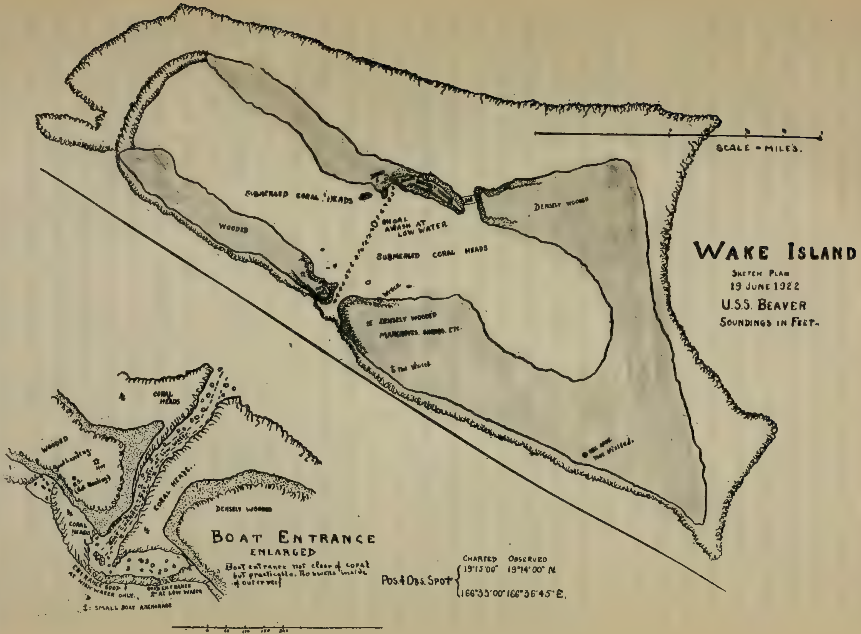
If the passage from Honolulu to Guam be made by way of Midway and Wake Islands, the total distance is increased to 3,517 miles, but is divided into legs of 1,149, 1,034 and 1,334 miles. Midway Island offers considerable advantages as a fueling and resting point for small craft. Any draft can anchor with fair protection in Seward Roads and fifteen feet can be taken into the well protected Welles Harbor. Destroyers have fueled in Seward Roads from deep draft tankers. The channel, although difficult, is well buoyed. As an aircraft station, Midway leaves little to be desired, as the lagoon offers a large area of safe depths for landings and get-aways.

Wake Island, although almost directly on the course between Honolulu and Guam is rarely visited and indeed is hardly ever sighted even by the transports which sail this route monthly. It is so low and lies so close to the course that it offers a serious danger to navigation and were it not for the almost constantly prevailing fair weather it would be most expedient to establish a light. From a strategic point of view, Wake Island could not be better located, dividing as it does with Midway, the passage from Honolulu to Guam into almost exact thirds.

Mr. Bywater's book, *Sea Power in the Pacific,* refers to Wake Island as a possible intermediate base and this book, in connection with problems in logistics where Wake Island would have offered a most acceptable fueling point for sea-weary ships, led the *Beaver,* homeward bound, on the Great Circle Course, to heave to for a few hours in the lee of the Island and land a small investigating party.

A spot marked "Good landing place" was discovered on the chart and the ship was hove to off this point. Although a considerable surf was running both whaleboats landed their parties without difficulty and were anchored a few feet off the beach.

The boat channel was found to be so choked with coral heads as to be impassable for a whaleboat except at flood tide. However, a pulling dory was towed in and this was pushed into the


WAKE ISLAND
SKETCH PLAN
19 JUNE 1922
U.S.S. BEAVER
SOUNDINGS IN FEET.
SCALE - MILES.
SUBMERGED CORAL HEADS
WOODED
SHOAL AWASH AT LOW WATER
SUBMERGED CORAL HEADS
DENSELY WOODED
DENSELY WOODED
BOAT ENTRANCE
ENLARGED
Boat entrance not clear of coral but practicable. No swells inside of outer reef
CORAL HEADS
WOODED
CORAL HEADS
CORAL HEADS
DENSELY WOODED
ENTRANCE GOOD AT HIGH WATER ONLY.
GOOD ENTRANCE 2' AT LOW WATER
SMALL BOAT ANCHORAGE
CHARTED
OBSERVED
Pos. & Obs. Spot
19°15'00"
19°14'00" N.
166°33'00"
166°36'45" E.

lagoon. The chart of Wake Island gives no soundings in the lagoon and all hands hoped to find a large area of deep water into which a channel could be blasted. However, we were disappointed in this as the lagoon was found to be very shallow, not over fifteen feet in the parts visited. Several huts were seen across the lagoon and these proved to be deserted shacks which had evidently been used by Japanese who had visited the island for birds, fish or pearls. We found a number of sake jugs, all of which were empty, and a large still which had unfortunately been used only for distilling drinking water.

Wake Island is a typical coral atoll. It is really a group of three Islands enclosing a shallow lagoon. There is no trace of igneous rock, the entire land being sand and coral boulders. There are neither pandanus nor cocoanuts, but all the higher parts are densely wooded with a shrub which grows to a height of fifteen feet or more. Some of the tidal flats are wooded with mangroves, and these with the dry-land shrubs provide a liberal supply of fuel for distilling fresh water. The total land area is about 2,600 acres, much of which lies at ten to fifteen feet above sea level so that the sea can hardly make a clean breach over the island as stated in the Sailing Directions. The group is about four and a half miles long by one and a half miles wide, with its major axis lying Northwest and Southeast, and as the prevailing winds range from East to Northeast, a lee is usually found.

The Island is the nesting place of innumerable birds among which were recognized the Laysan albatross, frigate birds, tern, boatswain or tropic birds, and a few snipe. The birds showed no fear and many were so tame that they could be handled. Nearly all of the shrubs and bushes contained nests. While crossing the lagoon, which is of course of an emerald green color, it was noted that the under parts of the white-breasted birds appeared a vivid green in the reflected light. This was so pronounced that it was hard to believe it was not their real color. It is a pleasure to be able to record that neither the birds nor their nests were interfered with by the *Beaver's* landing party. Several large rats were seen ashore, probably the survivors of a shipwreck. These must live on eggs and young birds and for the welfare of the colony it is unfortunate that they should have been introduced. A few lizards were seen and these with the

rats and birds probably comprise the whole of the land inhabitants of the Island.

"The lagoon is well stocked with fish" say the Sailing Directions for every atoll and it is certainly true of Wake Island. Our time ashore did not permit of fishing by approved methods but a few rifle shots and some lively grabbing netted us a considerable number of excellent fish. Unfortunately the *Beaver's* crew does not include an Ichthyologist, so their species could not be determined. A number of very large hermit crabs were collected as well as pieces of coral, sponges and shells, all of which were preserved and given to the Bishop Museum upon arrival in Honolulu.

While the landing party was ashore the *Beaver* remained hove-to off the boat channel. Three independent observers, each taking a number of sights, determined the position of the island, as charted, to be about three and a half miles too far to the westward. Unfortunately the time available did not permit taking double altitudes on shore for longitude, and the limited arc of a sextant precluded an artificial horizon meridian altitude for latitude.

Our four-hour reconnaissance gave us a clear idea of the limitations and advantages of Wake Island. As a base for surface vessels it is out of the question. Small craft such as destroyers and submarines could heave to during daylight to give the crew a few hours of recreation ashore which would be most welcome on the long passage, but so far as fueling is concerned Wake Island is useful only for the sake of the slight lee it affords.

It is as a base for aircraft that Wake Island would become of use. A large area of the lagoon is clear of dangers to a depth of five feet and over, and its smooth water offers excellent opportunities for refueling, repairing and resting the crews. At present it would be difficult to land stores on Wake but a shore party of about twenty men equipped with tools and dynamite could in a week open a channel to the lagoon which would be practicable for loaded motor sailing launches. Such a party could subsist itself indefinitely on Wake Island, especially as supplies could be landed from the transports which pass at least once a month. If the long-heralded trans-Pacific flight ever takes place, Wake Island should certainly be occupied and used as an intermediate resting and fueling port.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SHIPBREAKING IN GREAT BRITAIN

By E. C. Hamner, Jr., Naval Constructor, U. S. Navy

Shipbreaking has been an industry in the British Isles for many years, and so there are plants, having men trained to this work, that can do it quickly, systematically and economically. During the war, every old vessel that could be got into sea-going condition was put into active service. No vessels, naval or commercial, were broken during that period. When the war was over, nearly all countries possessed large quantities of tonnage, much of which soon became unprofitable to operate. Breaking of old ships, especially obsolete Naval vessels, became a large industry, and many plants were established in the British Isles to carry on this work. When scrap iron was in demand this was a lucrative business, but as time went on and the scrap market weakened, it required the greatest economy in breaking to make it pay. Today Germany, on account of cheap labor, and the demand there for scrap, is about the only country that can break ships profitably; consequently, Great Britain has found it necessary to dispose of large quantities of Naval tonnage to German Ship Breaking firms as no market was available at home.

It is rather a pitiful sight to go to the knackers yard and see great battleships, cruisers, destroyers, and other vessels that served so valiantly in the war, torn to pieces and stripped in this ruthless manner. These once proud monarchs of the seas, in the process of breaking, look, for all the world, like masses of twisted and broken wreckage after some great storm has passed. The blast that breaks them up, however, will later mould them into useful articles which will go to the four corners of the earth to help rehabilitate the desolation wrought by war.

The breaking plants must have deep water where ships can be moored, or else quay walls or piers to tie them up to during the

first part of the breaking. If moored in deep water, barges and derricks are necessary to handle the scrap from the ship to the shore, but where piers or quay walls are available this handling of weights is done, to a large extent, by locomotive cranes. When a ship comes to the plant to be broken, she is laid alongside of the pier or quay wall and the non-ferrous metal is removed, as far as possible, before the real breaking begins. Parts of the decks are cut out so that engine rooms, dynamo rooms, etc., may be more accessible. All auxiliary machinery that can possibly be sold, such as motors, dynamos, winches and pumps, instead of being broken to scrap, are carefully handled and kept intact; they are then removed to the storehouses, carefully cleaned and stored. All furniture from staterooms, cabins, and offices, that may be saleable, is also carefully removed, cleaned, and polished, to enhance its value, and stored for sale. The other non-ferrous metal, including piping, wiring, fittings, etc., is removed and sent to the sorting sheds.

The sorting sheds are usually temporary structures with dirt floors, and are equipped and fitted to break up non-ferrous metals to crucible sizes. In one other large plant, these sheds, which are conveniently located to the main piers where the non-ferrous metal is taken from the vessel, are equipped with certain tools to facilitate the breaking of the scrap. Along one side of the building runs a long work bench fitted with vices, at which boys and unskilled men remove bolts and nuts from flanges, and generally disassemble non-ferrous metal so that it can be cut into sizes by shears. Down the center of the shop there are three or four medium sized shears, and several smaller ones, for cutting the metal to crucible sizes. There are also installed tumbling barrels to clean paint and dirt from the sheared metal. All of these machines are driven by shafting which is usually driven by a motor that has been salved from one of the vessels. On the other side of the building are a series of bins, in which the sorted metal is stored; bins for the various kinds of metal, such as copper, yellow metal, gun metal, babbit and lead. Lead is usually melted into pigs, but no other kind of metal is melted. The larger non-ferrous castings are brought outside of these buildings and heated either by building a wood fire around them, if they are very large, or put into improvised furnaces which burn wood. The wood

used is that salved from decks and ceilings which is only good for use as firewood. After the metal is heated it is broken up by a drop weight which is handled by one of the cranes. A large piece of armor plate is used for the anvil; the drop weight usually consists of a smaller piece of armor plate, fitted with a ring bolt for hoisting, and operated by a trip hook. These drop weights are also used for crushing large copper pipes, or other bulky pieces of metal, so that they can be cut to crucible size by the shears. All metal that is saturated with oil is placed in the improvised furnaces to burn off the oil.

Non-ferrous metal is handled expeditiously by this method and, after sufficient quantities are on hand, it is either shipped in bulk to some foundry in Great Britain or barrelled for foreign shipment.

In removing non-ferrous metal from vessels, care must be exercised to avoid any piping or valves being removed that will open the vessel to the sea, for a large vessel sunk alongside of a pier is not always economically raised. I have seen one large battleship that had suffered from such a mishap.

After the bulk of the non-ferrous metal has been removed, the real breaking of the ship proper is begun. The ship is stripped of metal from the top downwards. It is the practice to first remove the turret tops, and then lift out the guns and turret machinery. In breaking the turrets a cut is made down the face of the turret about three or four inches wide, the bolts removed, and the turret plates can then be knocked down without removing each locking key. After the turrets have been dismantled the funnels, bridges, and superstructures, are broken; the tripod masts being left as long as possible for use as derricks in lifting heavy weights. After the top hamper, superstructure, and turrets, above the main deck, have been removed, the ship is cut down deck by deck, the wood being saved for lumber, or for heating castings as described above, or sold for firewood. All heavy plating is cut to furnace size by acetylene burners, either aboard ship or on the quay walls or piers abreast the ship. The framing and plating back of armor is cut by burners and the armor allowed to fall inboard on deck; from there it is handled by the crane and later cut by burners to furnace size. Plate of 20 pounds and under is taken out in as large pieces as the cranes can handle,

and later cut to size by shears, as this is more economical than burning it. The ship is cut down as far as is considered safe, and then towed to a shelving beach and beached at high tide, which leaves her entirely exposed at low tide. By this time so much weight has been removed that the draft of the ship is very small. On this shelving beach the breaking process continues until the whole vessel is cut up.

Oxy-acetylene is used entirely for cutting all structural parts of the ship; the heavy plating and armor plate are cut to furnace sizes and shipped in bulk by ships to the steel foundries. The lighter plate is usually sold to firms who straighten it first, and then stamp it into washers, wrenches, spanners or other small tools.

Most plants use portable metal bins to transport the metal after it has been cut to furnace size. These bins are made from about ten pound plate. They are about seven feet long and four-and-a-half feet wide; on three sides they have side plating to the height of about two-and-a-half feet. In the side plating are holes so that cranes can pick them up with sling hooks and transport them to any desired place. The bins are placed on the ship and the metal, after being cut, is put into them; when the bins are lifted from the ship they are weighed by a clock scale, weighing up to ten tons. This clock scale is used on the crane hook so that the bin and contents are weighed when they are picked up. The weight is marked on the bin with chalk and, as each bin is numbered and the tare of it known, the weight of the contents can be recorded. When a carrier ship is ready, the cranes pick up the bins and dump the contents directly into the ship's hold, so that a great amount of handling of heavy metal is avoided. These bins are also used to transport non-ferrous metal to the sorting shops and, in general, they serve the same purpose that portable platforms do in shops and storehouses where lifting trucks are available.

The breaking gang aboard a battleship consists of about sixty to seventy men, under a foreman who has direct charge of all work on that particular ship. About eight men are employed burning metal, with eight boys as helpers to learn the trade; about four riggers are necessary; the remainder of the gang are unskilled laborers. The work is crude and rapid. No care is

taken except with articles or machinery that can be sold as such. A careful inspection is made, however, to see that all non-ferrous fittings, bolts, nuts and washers, are removed from the metal before it goes into the handling bins. Shipbreaking firms in the British Isles generally consider that sixty or seventy men to a ship is the most economical number that can be used efficiently. With this number of men a battleship can be completely broken in about sixteen months. In Germany, where labor is at present cheap and the demand for scrap great, a maximum of about two hundred men are employed to each battleship, and the breaking time is reduced to nine or ten months.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SPIRIT OF THE OFFENSIVE

By Lieutenant Commander H. H. Frost, U. S. Navy

I. The Spirit of the Offensive and Offensive Operations

When Napoleon was asked how one might become a great captain, he said: "Wage offensive war like Alexander, Hannibal, Cæsar, Gustavus Adolphus, Turenne, the Prince Eugene, and Frederick."

All these commanders were imbued with the spirit of the offensive, but only one of them—Alexander—always acted absolutely on the offensive at all times, that is, always advanced and attacked with his full force without the slightest delay. All the others upon occasion were forced to limit their operations on account of unfavorable conditions over which they had no control. This was particularly so in the cases of Hannibal and Frederick; these generals in their later campaigns were forced to discontinue those bold and daring offensives which followed each other in such close succession during their first campaigns. However, it is undoubtedly a fact that these great leaders showed as great a talent and as great a spirit of the offensive in these later campaigns as they did in the most brilliant marches and battles of their earlier careers. Considering the great inferiority in numbers, the decrease in the quality of their troops through exhaustion and losses, and the generally unfavorable political conditions which both these leaders had to contend with in their later campaigns, it is believed that both of them acted with as great boldness and daring as in their first operations, when picked troops were available, when their enemies were comparatively unskilled in war, and when the political situations were much more favorable.

Napoleon himself in his later campaigns was compelled to limit his offensive operations, due to the small numbers and inferior quality of his troops, but even so when fighting in the immediate

vicinity of his capital, and when all his marshals had given up hope, he acted with a superb spirit of the offensive unequalled in any of his triumphant marches into Rome, Vienna, Berlin, and Madrid.

Alexander excepted, there are only two other leaders of long and varied experience who never limited to any degree their offensive operations. These are Suvorof and Nelson. All other leaders have deemed it necessary to do so at times. That this was not esteemed a fault by the Romans will be seen from Plutarch's opinion of Lucullus: "The most sagacious and experienced Roman commanders made it a chief commendation of Lucullus, that he conquered two great and potent kings by two most opposite ways, haste and delay. For he wore out the flourishing power of Mithridates by delay and time, and crushed that of Tigranes by haste; being one of the rare examples of generals who made use of delay for active achievement and speed for security."

The spirit of the offensive may and should be present at all times, either in absolute or limited offensive operations. The application of this spirit in war results in carefully considered employment of the maximum force available in persistent, active, rapidly conducted, and venturesome undertakings against the enemy for the accomplishment of missions, and the infliction of losses proportionate to our strength and the advantages and difficulties of the strategical or tactical situation with which we may be confronted.

In order to make use of this spirit of the offensive so as to decide the war in our favor in the shortest possible time, we must comply with three requirements:

1. Build up a personnel filled with the spirit of the offensive.

2. Develop an organization of such precision and mobility that this spirit may be effectively applied to it.

3. Actually apply the spirit of the offensive to maximum effect on all occasions.

II. Methods of Building Up the Spirit of the Offensive

There are various methods of fulfilling the first requirement, that is, of building up a personnel filled with the spirit of the offensive:

1. Having it inherent in our race.

2. Having it instilled in a military or naval service by long tradition.

3. Developing it in a service by persistent instruction.

4. Encouraging officers to read and study military and naval history, so that the value of an offensive spirit will be demonstrated and inspiration can be derived from the exploits of great commanders.

5. Appointing leaders who will inspire this spirit in their subordinates by their character and actions.

6. Building it up by winning victories over the enemy, so as to prove to our personnel that we have the ascendency over him.

III. Inherent Military Spirit

In the past certain nations and races have been inherently bold and venturesome. In most of these cases fighting was the sole business of the nation or race and these people naturally became inspired with a wonderful fighting spirit, or the sacred fire, as Napoleon was wont to call it.

Sparta was such a nation; though its people were of the same race as the rest of the Greeks, they were pre-eminent in bravery, boldness, and love of warfare. This was due to the remarkable code of laws enforced by Lycurgus, who made their daily training and preparation for war so arduous that actual warfare was welcomed as a relaxation. One of their laws prohibited the use of any fortifications, thus making it imperative that the war be carried into the territory of the enemy. As a result of this policy no invader set foot on Spartan territory for a period of six hundred years.

The Norsemen were, perhaps, even more aggressive and venturesome than the Spartans, for they went greater distances from their homes and generally in smaller numbers. The stories of their boldness and heroism are almost incredible. Their chief warriors were called "Berserks" because they refused to use coats of mail and went into battle stripped to the waist. In many bands it was a set rule that wounds received in battle could not be bandaged until the next day.

Civilization has so altered the life of nations that none are now organized, as were the Spartans and the Norsemen, solely for the purpose of warfare.

Conan Doyle's hero of the Napoleonic Wars, Brigadier Gerard, was wont to say that "all soldiers were equally brave, but that the French were slightly the bravest." The peoples of all the great nations today doubtless all hold the same opinion, but it can be said with certainty that our people are surpassed by those of no other nation for boldness, aggressiveness, originality, and initiative in their everyday life. Though we are not a military nation and have made little attempt to keep up our military and naval tradition, the recent war has proved that our people were splendid fighters when once brought into contact with the enemy. It may then be concluded that the material available for service in the army and navy has an inherent spirit of the offensive, and that very little will have to be done after its absorption into the service to complete the development of a most aggressive fighting spirit. What we must guard against particularly is a decrease of this spirit due to exhaustion in war and due to the principle of self-preservation, to which most men are subject, and which so limits and hampers all offensive action.

IV. The Effect of Tradition

When a nation is not composed solely of fighting men, an officers' corps or special body of troops may be developed with such a splendid tradition that new officers and men entering the organization will automatically become imbued with the fighting spirit which animates it.

The Thaban Sacred Band is an example of such a special body of troops. It was composed of only three hundred young men, but all of these were specially selected and all were attached to each other by personal affection. These were the first troops which defeated the Spartans in the open field and they performed remarkable feats of valor in all the battles of Pelopidas and Epaminondas. Until the Battle of Chæronea they were never defeated. It was the only defeat they ever suffered. Philip of Macedon, walking over the battlefield, wept when he saw the bodies of the entire three hundred lying in one spot just as they had fallen before his phalanx, and said: "Perish any man who suspects that these men either did or suffered anything that was base."

The Germans were generally very unsuccessful and erratic in warfare until Frederick the Great built up an army tradition and established an officers' corps which was perpetuated from father to son down to the World War. Field Marshal von Hindenburg describes the effects of this tradition as follows: "The historic fame of any military body is a bond of unity between all its members, a kind of cement which holds it together even in the worst of times. It gives place to an indestructible something which retains its power even when, as in the last great war, the regiment has practically had to be reconstituted time after time. The old spirit very soon permeates the newcomers." The Baireuth Dragoon Regiment, which distinguished itself during the Roumanian campaign of 1916, then still wore on its cartridge boxes the number "67," denoting the number of standards taken by the regiment in the great cavalry charge at the Battle of Hohenfriedberg.

The English are generally credited with being a commercial, and not a warlike nation, but nevertheless their naval and military services have been noted for their warlike spirit. The Royal Navy in the sixteenth, seventeenth, and eighteenth centuries beat down the Spaniards, Dutch, and French in a wonderful series of successes; during this long period their officer corps was animated by a remarkable spirit of the offensive, which was transmitted on by tradition from one war to the next.

The Samurai in Japan were a military clan greatly noted for their daring and high spirit. Nitobe thus describes an incident which well illustrates their noble courage: "It passes current among us as a piece of authentic history, that as Ota Dokan, the great builder of the castle of Tokyo, was pierced through with a spear, his assassin, knowing the poetical predilection of his victim, accompanied his thrust with the couplet—

> Ah! how in moments like these
> Our heart doth grudge the light of life;

whereupon the expiring hero, not one whit daunted by the mortal wound in his side, added the lines—

> Had not in hours of peace,
> It learned to lightly look on life."

It was the repetition of such stories as these to the Japanese youth, together with other military instruction, which made the

Japanese so careless of life and so fearless of death in the Russian War.

Our own navy has been blessed with a history and tradition unequalled by any. Although there have been some attempts, we have not made use of this splendid tradition as we should have for the instruction of our personnel. Nevertheless, the spirit of the offensive has always been alive in our service, and, although little opportunity was afforded for us in the World War to show this spirit in action, it is certain that had such opportunities been presented, our commanders at sea and in European waters would have made the most of them. It should be a matter of universal regret that the projected attack on Cattaro, or some other undertaking of equal difficulty, could not have been carried out by our naval forces. We have now to go back sixty years to the time of Farragut to find an example of such an operation, and no price would have been too dear for us to pay in order to demonstrate to our own personnel and to the other nations that we are still animated with the spirit of our greatest admiral.

V. INSTRUCTION AND INDOCTRINATION

In a number of cases the spirit of the offensive has been developed in a service by persistent instruction and indoctrination, even though that service may have had little or no history or tradition. It was in this way that Frederick William the First built up the wonderful army that he turned over to Frederick. Up to his time the Prussians had little or no reputation for fighting. In fact, during the Thirty Years' War, the Elector of Brandenburg had been forced to allow Gustavus to march through his country, saying to his councilors in despair, "*Que faire; ils ont des canons*" (What do; they have the cannon). Frederick William, with the aid of old Prince Leopold of Dessau, trained the Prussian Army for twenty years, but during this time they had scarcely been under fire. It was with this army, entirely without war experience, that Frederick won his victories over the veteran Austrian and French troops. The Prince de Ligne, an Austrian officer, thus describes the attack of Schwerin's infantry in the first engagement of the war: "I never saw anything in my life more beautiful. They marched with the greatest steadiness, arrow-straight, and their front was like a line, as if they had been

upon parade. The glitter of their arms shone strangely in the setting sun, and the fire from them went out no otherwise than a continued peal of thunder."

Beginning about 1890, the entire French military doctrine was changed from one in which the defense predominated to the old Napoleonic spirit of the offensive, the sacred fire, as he called it. Marshal Foch, then an instructor at the French War College, played an important part in this change; his longing for the offensive and his fighting spirit is illustrated by a story told of him by Repington in September, 1918: "I heard that when Balfour asked Foch what he meant to do, the Generalissimo spoke no word, but threw himself into a fighting attitude, hit out hard with his right fist, then hit hard with his left, and then gave the *coup de savate* with his right and left leg in turn. It is quite like him!"

It is true that Suvorof's soldiers were to a great extent schooled in war against the Turks, but nevertheless their peace training had much to do with their remarkable successes. Their general's fiery doctrine is illustrated by the following extracts from his *Oral Instructions for Training:*

"Keep a bullet for three days, sometimes for a whole campaign, when there's no need to use it. Shoot rarely, and when you do, aim; with the bayonet, strike hard; the bullet misses, the bayonet doesn't miss; the bullet's a fool, and bayonet's a fine lad.

"Attack. Leg supports leg, arm strengthens arm; many die in the volley; the enemy has the same weapons, but he doesn't know the Russian bayonet. Extend the line—attack at once with the cold steel; extend the line without stopping, the Cossacks to get through everywhere. In two lines is strength; in three half as much again; the first breaks, the second drives into heaps, the third overthrows.

"Strike once—throw the pagan from your bayonet; dead on your bayonet, one strikes at your head with his sword. Sword at your neck—jump back a pace, hit again, strike another, strike a third; a champion will kill half a dozen, and I have seen more. Keep your bullet in your musket; three leap at you—knock down the first, shoot the second, kill the third with your bayonet."

In our service, instruction in the advantages of the application of the offensive spirit may be given in two ways:

1. In the course of instruction at the War College and through the various papers issued by the War College.

2. In the official instructions for the conduct of war.

At the War College it should be remembered in tactical games and chart maneuvers that the moral effect, so important in war, is not present, and that the spirit of the offensive will always have a much greater effect in war than at the War College, although even there it will have its effect.

In all official instructions for the conduct of war the spirit of the offensive should permeate every paragraph. Activity, energy, initiative, speed should be everywhere encouraged, and instructions should be stated in positive, affirmative language, and not in negative prohibitions; phrases which might encourage excessive caution or inactivity should invariably be deleted.

VI. MILITARY HISTORY

To become completely imbued with the spirit of the offensive and the military idea it is desirable to read and re-read military history, whose pages are more fascinating and interesting than any fiction could be.

It soon becomes a definite conclusion of the reader and student of military history that victory comes to him who, after carefully weighing the situation, is willing to run risks, and carries out his plans with energy and boldness.

But even more valuable is the inspiration which such reading has been able to give to great commanders. In order to show the sources of such military inspiration a few pictures will be presented.

The ten thousand Greeks were in the center of the Persian Empire; their Persian commander had been killed in battle; their own Greek commanders had been assassinated by the Persians; they were thousands of miles from home, and surrounded by innumerable enemies. In this situation only one man rose above the difficulties and dangers which threatened them. This man, Xenophon, an unknown adventurer, who had never before held a command, addressed them with the calm assurance of an experienced general. "You are certain," he said, "that it is neither numbers nor strength which gives the victory in war, but that whichever side advances on the enemy with the more resolute

courage, their opponents, in general, cannot withstand their onset."

Read Plutarch's description of the Spartans advancing into battle: "When their army was drawn up in battle array and the enemy near, the king commanded the soldiers to set their garlands upon their heads, and the pipers to play the tune of the hymn to Castor, and himself began the pæan of advance. It was at once a magnificent and terrible sight to see them march on to the tune of their flutes, without any disorder in their ranks, any discomposure in their minds or change in their countenance, calmly and cheerfully moving with the music to the deadly fight."

The Nervii enter history but once. They were all killed in one battle with Cæsar's legions, but the conqueror tells us what kind of men they were: "But the enemy, even in the last hope of safety, displayed such great courage that when the foremost of them had fallen, the next stood upon them prostrate, and fought from their bodies; when these were overthrown, and their bodies heaped up together, those who survived cast their weapons thence, as from a mound, and returned our darts which had fallen between the armies."

We have only a few myths to tell us of the wonderful race of fighting men who lived in northern Scotland and Ireland during the first two centuries of the Christian era. The supposed poems of Ossian, which so inspired Suvorof and Napoleon, tell us of Cuchullin's last battle: "The chief of Erin overcame; he returned over the field with his fame. But pale he returned! The joy of his face was dark. He rolled his eyes in silence. The sword hung, unsheathed, in his hand, and his spear bent at every step. 'Carril,' said he in secret, 'the strength of Cuchullin fails. My days are with the years that are past: and no morning of mine shall arise. They shall seek me at Temora, but I shall not be found. Cormac shall weep in his hall, and say "Where is Tura's chief?" But my name is renowned; my fame is in the song of bards. The youth will say in secret, "O let me die as Cuchullin died; renown clothed him like a robe; and the light of his fame is great." Draw the arrow from my side; and lay Cuchullin beneath that oak. Place the shield of Caithbat near, that they may behold me amidst the arms of my fathers.'"

The Duke of Alva, after massacring every person in the little town of Naarden, which had absolutely no means of defense, paid a perfect tribute to its brave burghers in his report to the Spanish king: "It was a permission of God that these people should have undertaken to defend a city which was so weak that no other persons would have attempted such a thing."

Field Marshal Browne, an Irish soldier in the Austrian service, is little known to any of us; yet a little story of him, written by one of his officers, makes one of the beautiful pictures of history: "You saw the great man, how he sacrificed himself to this enterprise. What Austrian field marshal but himself would have ever lowered his loftiness to lead, in person, so insignificant a detachment, merely for the public good! Sharing with his troops all the hardships, none excepted, of those critical days; and in spite of a violent cough, which often brought the visible blood from his lungs, and had quite worn him down, exposing himself, like the meanest of the army, to the tempests of rainy weather. Think what a sight it was, going to your very heart, and summoning you to endurance of every hardship—that evening when the field marshal, worn out with his fatigues and his disorder, sank out of fainting-fits into a sleep! The ground was his bed, and the storm of clouds his coverlid. In crowds his brave war-comrades gathered round; stripped their cloaks, the coats, and strove in noble rivalry which of them should have the happiness to screen the Father of the Army at their own cost of exposure, and by any device to keep the pelting of the weather from that loved head!"

At the Battle of Prag, Field Marshal Schwerin, seventy years old, seeing his own regiment in retreat, seized the colors and led them back to the attack along a narrow causeway. "Five bits of grapeshot, deadly each of them, at once hit the old man; dead he sinks there on his flag; and will never fight more," (Carlyle). But his troops, mad with grief and rage, storm the position and win the battle.

The evening after the battle of Chancellorsville, General Lee wrote to Jackson a note which should be classed among the masterpieces of literature:

General,

I have just received your note, informing me that you are wounded. I cannot express my regret at the occurrence. Could I have directed

events, I should have chosen for the good of the country to be disabled in your stead.

I congratulate you upon the victory, which is due to your skill and energy.

Very respectfully, your obedient servant,

R. E. LEE, GENERAL.

When this note was read to the wounded general, he said very quietly, "General Lee is very kind, but he should give the praise to God."

A few days after the battle between the *Monitor* and the *Merrimac,* Lincoln was attending a cabinet meeting; during the meeting someone remarked that Lieutenant Worden, the commanding officer of the *Monitor,* was in the city, badly wounded. Without waiting for the end of the important meeting, the President arose, saying, "Excuse me, gentlemen, I must see this fellow." He went immediately to the house at which the wounded officer was being cared for. As Lincoln entered the room, Worden was lying on a sofa; his eyes were bandaged, and his face bruised and bloody as the result of the terrible wound he had received when a shell exploded against the armor of the conning tower within a foot of the slit through which he was looking.

As the President took his hand, the wounded hero said: "Mr. President, you do me great honor by this visit." "Sir," answered Mr. Lincoln, as the tears ran down his face, "I am the one who is honored in this interview."

During the World War there was no important action which was not illustrated by some acts of heroism which have fortunately been preserved for us. At Coronel, Cradock headed in with his flagship toward the German line in order to try to save the other British ships. The *Monmouth* refused to surrender even when the ship had such a list that none of her battery could be brought to bear, and went down with colors flying when sunk by the *Nürnberg.* The heroism of the *Monmouth's* captain was more remarkable in view of the fact that the sea was so rough that it was evident that should the ship go down it would not be possible to save a single man of the crew.

In the Battle of the Falkland Islands, Von Spee went down fighting his flagship with the utmost heroism, not a man on the *Scharnhorst* being saved. When the *Gneisenau* was sinking and all guns were silent, the captain sent an officer around the

ship with orders to try to fire a few more rounds. It was found possible to load one gun which was pointed so high in the air that there was no possibility of making a hit with it; nevertheless, it was fired once, whereupon the British re-opened fire and soon sent the gallant *Gneisenau* down. The conduct of the *Nürnberg* and *Leipzig* was also perfect.

In the Heligoland Bight action the *Mainz* and *Köln* fought, entirely without support, a whole battle-cruiser squadron at short range. At the Dogger Bank the *Blucher* received the fire of all the British battle cruisers and was fought to the end.

At Jutland the British destroyers *Nestor, Nicator, Nomad, Moorsom, Onslow,* and *Shark,* with many others, fired torpedoes at enemy capital ships at almost point-blank range, in some cases when they were themselves sinking. A few dying men from the destroyer leader *Tipperary,* while floating on a Carley raft, were made known to their friends by the song, "It's a long way to Tipperary," which they were manfully singing.

On the German side the defense of the *Wiesbaden* and the superb gallantry with which Admiral Hipper led the battle cruisers will be remembered as long as history exists.

The British cruiser *Warrior* had been badly damaged in the day action, and the next morning was in a sinking condition. The captain of the seaplane carrier *Engadine* took his ship alongside in a very heavy sea, so that the ships pounded against each other badly. The men of the *Warrior* commenced to pass over to the *Engadine.* "At this moment," writes an officer of the *Engadine,* "the captain considered that there was too much haste, and he ordered the bugle 'Still' to be sounded. The result was wonderful. Not a single man passed from the *Warrior* to the *Engadine* after the bugle was sounded, but every man fell back from the ship's side against the funnel casing, just as they would have done if the bugle call had been sounded at drill. It was a wonderful sight; a triumph of organization, discipline, and courage combined."

On of the bravest things of the war was the attempt of a German submarine manned entirely by officers to enter Scapa Flow during the last months of the war. The submarine, of course, was blown up by a mine, and the exploit had no effect other than to demonstrate the fact that, even when the Germans

had definitely lost the war, their officers knew how to die. This, after all, is by no means an unimportant result of such a small undertaking.

The blocking of Zeebrugge has fortunately been described in detail and has rightly won the admiration of the world. It is a distinct loss to our service that we were not permitted to make a similar attempt. Whether it would have succeeded or failed would have made no difference.

(To be continued)

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TEMPORARY VERSUS PERMANENT DETAIL OF SPECIALISTS: EXPERIENCE OF ARMY ORDNANCE DEPARTMENT

LIEUTENANT (j. g.) R. E. BASSLER, (CEC), U. S. N.

The material contained in this article has been taken from the various appropriation bills and reorganization acts affecting the War Department. Only data bearing on the question of temporary versus permanent detail have been included. The purpose of the article is to present in a concrete form the experience of another government department sometimes cited in support of amalgamation.

The history of the Army Ordnance Department (or corps, depending on wording in particular bill) is interesting when considering amalgamation. There is to be found in this brief history an example which is as nearly analogous to the Navy's problem as can be cited.

In articles on the amalgamation question, proponents or opponents very rarely define the scope of the amalgamation under discussion; also there is a considerable lack of unanimity of opinion among proponents as to what corps should be included. The history contained herein may therefore be of benefit to the Navy by nullifying certain arguments that have been advanced as to the extent of amalgamation and its completeness, and by showing some of the alleged advantages to be chimerical.

The conclusions derived by the author are entirely unofficial and uninspired, and it has been his endeavor to arrive at correct and unbiased deductions. We should not hesitate to profit by the experience of another branch of the service especially since conditions are somewhat analogous. A wise man makes mistakes but never makes the same one twice.

The line of the Army may be considered as the Infantry, Cavalry, and Artillery services. Army regulations include in the line other combatant branches which, however, are really corps, such as the Air Service, since personnel is not supplied by detailing officers temporarily, but by permanent detail. The Army Ordnance Department supplies the line and other services with ordnance equipment. During the Revolution these duties were vested in a Purveyor of Supplies, which office ceased to exist at the close of the war. The office of Purveyor of Supplies was re-created on the recommendation of President Washington in 1795. This office was abolished in 1812, and in its stead an Ordnance Department was created.

From 1821 to 1832 its officer personnel was obtained by the detail system, that is, officers were assigned to the Ordnance service from the Artillery and functioned directly under the Secretary of War. In 1832 the Department was re-established, the President selecting the officers from the line (as considered above) who comprised the corps initially. In 1861 the Department was greatly enlarged, and its chief given the rank of Brigadier General, and it was expanded further in 1863. In the reorganization of 1901, following the Spanish-American War, the system of permanently commissioning officers in the Ordnance Department was abolished, and the detail system again supplied the personnel. Under the terms of the Reorganization Act, of 1901, line officers, except in the higher grades, were detailed for four years with the Ordnance Department and then they had to have two years of line duty before being again eligible for such detail.

These assignments to the Ordnance Department proved to be very unpopular with line officers for two reasons: First, the examinations for initial detail to the Ordnance Department were very severe, and second, officers were examined for promotion in their permanent branch of the service at any stage of their tour of duty in the Ordnance Department. They therefore had to study a second specialty in order to gain entrance into the Ordnance Department, and while serving in that Department, they had to keep abreast of the progress being made in their own particular line specialty.

Consequently the line officers did not attempt to qualify themselves for the Ordnance Department, and that Department soon

began to suffer from lack of interest on the part of the line. The law requiring officers to have two years of line duty before being again eligible for detail to the Ordnance Department was modified to one year, and finally the one-year clause was eliminated in special cases, which of course kept officers continuously out of their specialty and in the Ordnance Department. Special legislation was therefore required to correct the apathy existing on the part of the line officer for duty in the Ordnance Department, and it is at this point that the case parallels the difficulty with our own Bureau of Engineering, in that special legislation was needed in 1916 to provide designing engineers. In 1906, therefore, a law was passed stating that details to ordnance duty could be made from the line from the grade in which the vacancy existed, or below. The lack of interest on the part of the line was to be overcome by granting officers detailed to Ordnance duty a temporary promotion. Needless to say, the majority of vacancies in the Ordnance Corps, particularly in the grades of Major and Captain, were filled by line officers in the grades of Captain and First Lieutenant, respectively. This inducement somewhat lessened the apathy of the line officer for ordnance assignment, and the Ordnance Department once more had officers sufficient for their requirements. It is interesting to note that upon our entrance into the World War detailing officers into the Ordnance Department immediately ceased, and the officers in that Department were continued in their assignments. In the reorganization which followed the World War, an Ordnance Corps was again established in the Army, which would seem to indicate that the system of detailing officers temporarily to the Ordnance Department had been tried and found wanting.

I believe it is reasonable to draw the following conclusions from the above history.

(1) The efficient line officer will shy at duties which remove him from his profession and hurt his chances of promotion. If he is at all interested in his particular specialty and anxious to make a success of it, he will of necessity neglect his part-time specialty, regarding it as an assignment to be passed through as quickly and easily as possible. He will regard the details of this assignment as something over which little time is to be wasted.

(2) To make the detail system function properly, there must be an inducement offered in one form or another, whether it be higher rank in the Army Ordnance case, or engineering duty only in the Naval Engineering example. The fear that an assignment to another specialty will decrease his chances of selection up must be removed.

(3) In time of war the detailing system was immediately abolished because of its inefficiencies, and the absolute necessity of retaining the personnel the Department happened to have, at that particular time.

(4) The officer personnel under the corps system, in cases of emergency, are a more competent body of men, more capable of immediate expansion, and have better *esprit de corps* than a similar body of officers under temporary detail system. For instance, under the temporary detail system at the outbreak of the war, we find the Department composed of officers, the majority of whom are in their first tour of duty and can be hardly called specialists. Others may be in a second assignment, and probably very few of them will have more than two assignments. Furthermore, under the temporary detail system, the type of knowledge stored away in an officer's brain is entirely different from that which he would attempt to remember were his temporary detail his permanent specialty. In cases of emergency under the corps system, there is a body of specialists whose capabilities are known to the Chief of the Corps, and whose assignments can be intelligently made. This same body of men are eager to hold up their end of the prosecution of a war because of their pride in the organization of which they are and always will be members.

(5) The system of detailing line officers to ordnance duty was absolutely wasteful and uneconomical, for the history of the detail system is replete with examples similar to the following: Wherein line officers trained in Infantry, Artillery or Cavalry filled positions such as Superintendent of Factory, Machine Shop, Testing Shop, Paint Shop, Powder Expert, etc. The line officers were not experienced sufficiently to assume these duties and discharge them efficiently. As soon as they became familiar and efficient in their duties, their tour of duty ended and they were returned to their specialties in the line.

(6) The line officers' assignments in ordnance neither improved the quality nor quantity of ordnance equipment, nor did it improve their qualifications for the line.

(7) Enlisted men in the Army (as in the Navy) rarely change their specialty, and the Ordnance Department always has had its enlisted men for ordnance duty only. It is obvious that should enlisted men be switched from specialty to specialty, more or less confusion would reign due to the fact that there would be no organization to carry on.

(8) An officer cannot become a specialist under the temporary detail system. In other words, a "so-called" specialist under the detail system is not as efficient, capable, etc., as the specialist obtained under the corps of permanent assignment system.

(9) Any proposed amalgamation, therefore, which has for its object the tempororay detail of line officers to specialist duties, is unsound. The experience outlined in the above brief at least shows this conclusion warrantable in the case of the Ordnance Department, and it is believed that the instance cited is as nearly analogous to our own general problem as can be obtained.

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LIFE INSURANCE AS APPLIED TO THE NAVAL SERVICE

By Edward L. Webb

Having become a life insurance solicitor in February, 1921, and having spent the last six months practically altogether in soliciting naval officers, the author has written the following article with the view of showing naval officers how mortality in the Naval Service compares with that of civilians, with a few suggestions as to which is the best type of insurance and the reasons therefor.

Let us start with the American table of mortality which practically all companies and the U. S. Government use. Table I is made up from experience gained on insurable lives.

Now in working out Table II, which follows, I have applied Table I to each class of the U. S. Naval Academy beginning with the class of 1860, and ending with the class of 1916. In doing this, my data was taken from the U. S. Naval Academy Graduates Association's *Register* as of January 1921, which shows the members who are living; those who are dead; and those who are unaccounted for. The members "unaccounted for" have not been considered, and it was assumed that age upon graduation was 22.

A general summary of Table II shows that mortality varies widely between classes and that the per cent of actual mortality to expected mortality in some cases is exceedingly high with a general average of 95.8 per cent.

We will now compare this with the experience of ten of the larger insurance companies on civilian lives over the period of 1917-21 inclusive.

TABLE I

AMERICAN TABLE OF MORTALITY

Age	*Number Surviving*	*Deaths in The Year Following*	*Death Rate per 1,000*	*Expectation in Years*
10	100000	749	7.49	48.72
11	99251	746	7.52	48.08
12	98505	743	7.54	47.45
13	97762	740	7.57	46.80
14	97022	737	7.60	46.16
15	96285	735	7.63	45.50
16	95550	732	7.66	44.85
17	94818	729	7.69	44.19
18	94089	727	7.73	43.53
19	93362	725	7.77	42.87
20	92637	723	7.81	42.20
21	91914	722	7.86	41.53
22	91192	721	7.91	40.85
23	90471	720	7.96	40.17
24	89751	719	8.01	39.49
25	89032	718	8.07	38.81
26	88314	718	8.13	38.12
27	87596	718	8.20	37.43
28	86878	718	8.26	36.73
29	86160	719	8.35	36.03
30	85441	720	8.43	35.33
31	84721	721	8.51	34.63
32	84000	723	8.61	33.92
33	83277	726	8.72	33.21
34	82551	729	8.83	32.50
35	81822	732	8.95	31.78
36	81090	737	9.09	31.07
37	80353	742	9.23	30.35
38	79611	749	9.41	29.62
39	78862	756	9.59	28.90
40	78106	765	9.79	28.18
41	77341	774	10.01	27.45
42	76567	785	10.25	26.72
43	75782	797	10.52	26.00
44	74985	812	10.83	25.27
45	74173	828	11.16	24.54
46	73345	848	11.56	23.81
47	72497	870	12.00	23.08
48	71627	896	12.51	22.36
49	70731	927	13.11	21.63

TABLE I Continued

AMERICAN TABLE OF MORTALITY

Age	Number Surviving	Deaths in The Year Following	Death Rate per 1,000	Expectation in Years
50	69804	962	13.78	20.91
51	68842	1001	14.54	20.20
52	67841	1044	15.39	19.49
53	69797	1091	16.33	18.79
54	65706	1143	17.40	18.09
55	64563	1199	18.57	17.40
56	63364	1260	19.89	16.72
57	62104	1325	21.34	16.05
58	60779	1394	22.94	15.39
59	59385	1468	24.72	14.74
60	57917	1546	26.69	14.10
61	56371	1628	28.88	13.47
62	54743	1713	31.29	12.86
63	53030	1800	33.94	12.26
64	51230	1889	36.87	11.67
65	49341	1980	40.13	11.10
66	47361	2070	43.71	10.54
67	45291	2158	47.65	10.00
68	43133	2243	52.00	9.47
69	40890	2321	56.76	8.97
70	38569	2391	61.99	8.48
71	36178	2448	67.67	8.00
72	33730	2487	73.73	7.55
73	31243	2505	80.18	7.11
74	28738	2501	87.03	6.68
75	26237	2476	94.37	6.27
76	23761	2431	102.31	5.88
77	21330	2369	111.06	5.49
78	18961	2291	120.83	5.11
79	16670	2196	131.73	4.74
80	14474	2191	144.57	4.39
81	12383	1964	158.61	4.05
82	10419	1816	174.30	3.71
83	8603	1648	191.56	3.39
84	6955	1470	211.36	3.08
85	5485	1292	235.55	2.77
86	4193	1114	265.68	2.47
87	3079	933	303.02	2.18
88	2146	744	346.69	1.91
89	1402	555	395.86	1.66
90	847	385	454.55	1.42
91	462	246	532.47	1.19
92	216	137	634.26	.98
93	79	58	734.18	.80
94	21	18	857.14	.64
95	3	3	1000.00	.50

TABLE II

Class of	Avge. Age 1921	No. Members	No. Accounted for by Ass'n Register	No. living in January 1921	No. dead in January 1921	Expectation of living members	Expectation of dead members	%-Expectation of deaths	%-Actual to Expected Deaths
1860	83	25	25	4	21	2.4	22.6	90.5	92.9
61	82	27	27	2	25	2.8	24.2	89.6	103.3
62	81	32	31	5	26	4.2	26.8	86.4	97.0
63	80	55	52	3	49	8.3	43.7	84.1	112.1
64	79	50	50	14	36	9.2	40.8	81.7	88.2
65	78	85	80	14	66	16.6	63.4	79.2	104.1
66	77	73	68	15	53	15.9	52.1	76.6	101.7
67	76	87	83	20	63	21.7	61.3	73.9	102.7
68	75	99	94	29	65	27.1	66.9	71.2	97.1
69	74	74	72	21	51	22.8	49.2	68.4	103.6
70	73	68	68	18	50	23.3	44.7	65.7	111.8
71	72	49	46	11	35	17.0	29.0	63.0	120.6
72	71	25	25	5	20	9.9	15.1	60.3	132.4
73	70	34	34	16	18	14.4	19.6	57.7	91.8
74	69	40	38	17	21	17.1	20.9	55.1	100.4
75	68	48	48	19	29	22.7	25.3	52.7	104.6
76	67	45	45	22	23	22.4	22.6	50.3	101.7
77	66	45	44	23	21	22.9	21.1	48.0	99.5
78	65	50	48	31	17	26.0	22.0	45.9	77.2
79	64	64	64	29	35	36.0	28.0	43.8	125.0
80	63	79	71	31	40	41.3	29.7	41.8	134.7
81	62	96	96	56	40	57.6	38.4	40.0	104.1
82	61	60	59	40	19	36.5	22.5	38.2	84.4
83	60	54	53	31	22	33.7	19.3	36.5	114.0
84	59	46	46	31	15	30.0	16.0	35.0	93.7
85	58	36	35	26	9	16.7	18.3	33.3	49.1
86	57	25	23	14	9	15.7	7.3	31.9	123.2
87	56	44	43	25	18	29.9	13.1	30.6	137.4
88	55	35	35	24	11	24.8	10.2	29.2	107.8
89	54	35	35	28	7	25.2	9.8	28.0	71.4
90	53	34	34	30	4	25.0	9.0	26.7	44.4
91	52	46	45	40	5	33.5	11.5	25.5	43.4
92	51	40	40	31	9	30.2	9.8	24.5	91.8
93	50	44	43	29	14	33.0	10.0	23.4	140.0
94	49	47	45	38	7	35.0	10.0	22.4	70.0
95	48	41	38	31	7	29.9	8.1	21.4	86.4
96	47	38	38	34	4	30.2	7.8	20.5	51.2
97	46	47	46	39	7	37.0	9.0	19.5	77.7
98	45	39	39	34	5	31.7	7.3	18.6	68.5
99	44	53	53	49	4	44.3	8.7	17.7	45.9
1900	43	61	58	52	6	48.0	10.0	16.9	60.0
01	42	67	66	58	8	55.4	10.6	16.0	75.4
02	41	59	59	54	5	50.0	9.0	15.2	55.5
03	40	50	49	45	4	42.0	7.0	14.3	57.1
04	39	62	58	52	6	50.2	7.8	13.5	76.9
05	38	114	110	102	8	96.0	14.0	12.7	57.1
06	37	116	114	107	7	100.4	13.6	11.9	51.4

TABLE II Continued

Class of	*Avge. Age 1921*	*No. Members*	*No. Accounted for by Ass'n Register*	*No. living in January 1921*	*No. dead in January 1921*	*Expectation of living members*	*Expectation of dead members*	*%-Expectation of deaths*	*%-Actual to Expected Deaths*
1907	36	209	205	186	19	182.2	22.8	11.1	83.3
08	35	201	193	184	9	172.2	20.8	10.3	43.2
09	34	174	165	153	12	149.5	15.5	9.4	77·4
10	33	131	128	121	7	117.0	11.0	8.6	63.6
11	32	193	188	173	15	173.1	14.9	7.9	100.6
12	31	156	150	146	4	139.5	10.5	7.0	38.1
13	30	139	138	133	5	129.3	8.7	6.3	57.4
14	29	154	151	144	7	142.7	8.3	5.5	84.3
15	28	179	179	166	13	170.6	8.4	4.7	54.7
16	27	177	176	172	4	169.2	6.8	3.9	58.8
		4256	4146	3027	1119	2971.2	1174.8		95.8

A summary of Table III shows civilian mortality rather uniform between companies; that it fluctuates from year to year and very widely in 1918 which was caused principally by the epidemic of influenza. However, the actual to expected mortality is 68 per cent over the period of five years for the ten companies.

A comparison of Tables II and III shows service mortality to

TABLE III*

Per cent Actual Deaths to Expected Deaths of Ten Companies for 1917-21 inclusive

	1921	1920	1919	1918	1917
Metropolitan	49.10	56.74	72.65	105.58	64.18
New York Life	56.20	68.80	78.60	94.60	71.00
Equitable	52.89	61.51	71.25	101.78	70.97
Prudential	49.37	59.90	68.48	110.01	61.00
Mutual Life	56.45	66.74	63.03	95.73	71.66
Northwestern	47.72	54.55	57.09	78.12	54.23
Mutual Benefit	48.69	52.23	60.75	86.67	51.35
Penn Mutual	53.10	70.10	68.40	105.25	64.75
Travelers	50.56	53.81	56.69	98.17	54.30
Aetna	54.65	66.28	66.00	99.61	69.37
Average	51.87	61.07	66.29	97.55	63.28

*Taken from *Flitcraft's Compend*, 1922 Edition.
General Average 68 per cent.

be 27 per cent higher than civilian mortality. Hence that is the reason why the majority of companies "rate up" naval officers $5.00 per $1,000, or 5 years in age. Those that do offer you insurance at the same rate as civilians, limit you in amount to about one-tenth allowed an individual civilian.

The thought will occur to some that as actual mortality is only 68 per cent of expected, life insurance companies are making considerable money. That assumption is erroneous in the case of Mutual Companies, (and the majority are mutual to-day) for surplus earnings are refunded to policy-holders in an annual dividend.

Three factors govern the dividend:

(1) Savings on mortality,
(2) Savings on expenses of operation,
(3) Excess earnings on investments.

The latter two do not vary much but in the case of the first, it does as shown in Table III. For instance, the large losses in 1918 due to "flu" caused a reduction in dividend later on for a period of one year by most companies.

In the case of Stock Companies, these surplus earnings go to the stockholders. In other words, they issue non-participating contracts in which you waive all your right to share in the savings from mortality, expense and interest.

The general deductions to be made from Tables I, II and III are:

(1) The need of Life Insurance is greater in the service than in civilian life.
(2) A life insurance policy (not rated up) is a better proposition for a naval officer than a civilian. In other words, the officer gets more for his money.

Best Type of Policy

In discussing the best type of policies offered, it should be borne in mind that the primary function of Life Insurance is what is called "protection." There are numerous secondary functions but "protection" is its biggest asset. Therefore, the best policy is the one that carries the lowest premium and that one is the Straight Life policy.

Below are a few types arranged in order of preference. Figures are at age 25 per $1,000. per year, quoted by a mutual company.

Straight Life	$18.28
30-Payment Life	$21.50
Endowment at 60	24.64
20-Payment Life	26.48
30-Year Endowment	28.74
20-Year Endowment	44.84

Dividends will reduce above figures in later years, generally beginning at the end of second year.

The average life of a man 25 is 38.8 years. Therefore, when insured on Straight Life plan, we assume he will make 38.8 payments of $18.28 or $709.26 per $1,000, (reduced by future surplus earnings). Suppose he lives 38.8 years or to retirement age. He can then stop his payments and have a paid-up policy of $820 for each $1,000 face value. In fact he has a paid-up value option beginning the end of third year and increasing each year thereafter, and that paid-up value is in proportion to and always greater than the amount paid in.

Table II shows about 56.2 per cent each class should reach retirement age, excluding resignations, retirements, etc. Those that are fortunate enough to reach age 64 can stop payments and exercise above option; those that do not reach age 64 leave their estate better off by taking the Straight Life policy.

The 30-Payment Life plan is the next best, but it increases your protection costs by one-sixth.

The Endowment at 60 has the secondary function of providing a lump sum available about the time you retire. Is not your retired pay when you retire on account of age ample to take care of you and a fair size family? Therefore, that function is secondary and depends upon individual circumstances.

The 20-Payment Life comes next with a premium nearly 50 per cent higher than Straight Life.

The 20-Year and 30-Year Endowment provides the means for accumulating a sum for use at some remote date but the risk to the Company is lessened considerably owing to the large premium required to be charged to pay you in case you are living at the maturity of the policy.

Past experience shows that when a man 25 matures a 20-Year Endowment at 45, he usually renews his insurance on the Straight Life plan at age 45, which then will carry a premium of about $35 per $1,000. It would have been better had he taken Straight Life Insurance at 25 and invested the difference in premium in a saving fund.

A majority of older officers realize that Straight Life insurance is the best, but younger ones do not. It is to the agent's interest to sell you an Endowment or limited payment life policy in preference to Straight Life, but it is to your interest to buy the Straight Life whether married or single. The sale can frequently be made more easily on the first two than the last.

Another feature of Life Insurance policies that draws attention is the Disability Clause they now contain. Many sales have been made on this feature alone. It is well to include the provision in your policy for the cost is small, about $.65 per $1,000 per year at age 25, but it is a minor part of the contract. Average life after total and permanent disability is about 3 years.

Let us now discuss the biggest and best features of a Life Insurance contract and these are the various settlement options. What are called the non-forfeiture provisions such as Cash Values, Paid-Up Values and Extension, protect you, but the settlement options protect your beneficiary and that is your main object when buying a Life Insurance policy.

One is usually very eager to leave his insurance to his beneficiary in a lump sum. It is a mistake to do so. It is the equivalent of having $10,000 worth of Liberty Bonds, knowing you were going to die, then advising your beneficiary to sell them and invest the proceeds to the best of her or his ability. How many would do that? Not many. Your beneficiary is accustomed to receiving a monthly allotment from the Navy Department. Your insurance should be made payable in the same way.

Experience shows that the average beneficiary soon dissipates a "lump sum" by poor investments. It requires financial skill to invest a sum of money safely over a period of years. Life Insurance companies are equipped to do that better than your beneficiary. Furthermore, the income is guaranteed—more than a trust company will do when executing an estate. By guaranteed, I mean backed by the assets of the company, which in the larger ones approximate closely to a billion dollars each. The proceeds

of your policy earn in general 4½ per cent interest while being paid off. It is far better to leave a sufficient monthly income for five or ten years than leave it in a lump sum. It can be made guaranteed for your beneficiary's life time. Any arrangement can be made to suit the most exacting situation.

In summing up, a great many officers can change their present types of policies to better ones that will react to their advantage. By that I do not mean giving up a policy to take one in another company, for that is a losing proposition, but I mean from one plan to a better plan in the same company.

A great many should change their method of settlement, converting all their present policies to a monthly income basis, or a small lump sum and balance on monthly income. That will react to the advantage of their beneficiary.

Many are inadequately insured and some do not carry any insurance. A reflection on service mortality, Table II, shows clearly the imperative need of it in the service. For when one does not insure he asks his beneficiary to take a chance on one single life that a company could not do, which is clearly shown in Table II—the wide fluctuations between classes. This is more pronounced when considered as an individual proposition.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HINTS ON TACTICAL MANEUVERS

By Lieutenant Commander Jules James, U. S. Navy

1. On making a careful analysis of maneuvers it is realized that the big problem, pervading the entire system, is that of losing bearing with reference to a guide unit. With this well in hand a maximum of time and attention can be given to other details.

2. Most of the following notes and tables were prepared to furnish a systematic solution of this problem so that it could be handled without confusion, and with least effort. They are the result of several years of practical experience with tactical exercises in the fleet, and it is not known where anything to take their place can be found. It is hoped that they will be of use to the service at large.

3. Generally considered, in maneuvers, the prompt attainment of the bearing is more important than the prompt attainment of the distance. Effort to reach both as quickly as possible should be made, but if the bearing is attained promptly it is rather a simple matter to ease in or out to the proper distance. Also, the amount of distance usually lost seldom interferes with a maneuver that is to follow immediately.

Tables

4. Tables "A" (Figure 1.) were constructed from data obtained by taking actual observations of *degrees* (*in bearing of the guide*) *lost in making turns of various amounts.* From the observations taken a complete set of curves was constructed, and the tables were taken from these curves. Either the curves or the tables can be used, but the latter were found to be more convenient for use on the bridge.

TABLES OF DEGREES OF BEARING

LOST IN TURNING

	Distance from Guide	Degrees Turn							
		20	30	40	50	6	70	80	90
12 Knots	1700	3	5	7	9	12	15	17	21
	3400	1½	2½	3½	4½	6	7½	8½	10½
	4000	1	2	3	4	5	6½	7½	9
	5000	1	2	2	3	4	5	6	7
	6000	½	1½	2	2½	3½	4½	5	6

	Distance from Guide	Degrees Turn							
		20	30	40	50	60	70	80	90
15 Knots	1700	7	10	13	17	20	24	27	30
	3400	3½	5	6½	8½	10	12	13	15
	4000	3	4½	6	8	8½	10	11	13
	5000	2	3	4	6	7	8	9	10
	6000	1½	2½	3	5	6	7	7	8

Fig. 1 (Tables A)

5. In studying and executing these turns, the surprising thing that is brought to light is the large loss in bearing resulting from a turn at high speed, as compared with the loss resulting from the same turn at a low speed. Only by using data such as is furnished here can bearings be obtained with certainty under various conditions of speed, and of distance from the guide.

6. In turning, a ship on the quarter of the guide of course loses fewer degrees in bearing during the turn, and in settling

down, than does one on the beam. She loses the same number of yards astern of the point at which she begins the turn, but it was found easier to work with degrees of bearing lost than with yards lost. Consequently, degrees were embodied in the tables. They represent the losses for average position, or bearing, relative to the guide. They will be found sufficiently accurate and extremely useful.

7. To explain the use of these tables:

(See Figure 2.) Suppose that from a position 1,700 yards 30° on the starboard bow of the guide you are to steam out at 60° from the base course, speed 15 knots, to take position at the same distance 60° on the starboard bow of the guide. (If convenient see second figure on page 35 of the publication familiarly known as standing order No. 2.)

8. In actual practice the procedure is as follows:

The 15-knot table shows that at a distance of 1,700 yards from the pivot, you will lose 20° in making a 60° turn. Therefore, you are to resume the base course when 20° ahead of the bearing on which you are to form.

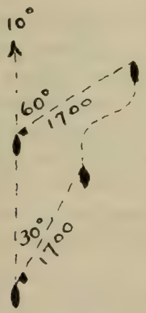


FIG. 2

Suppose the course of the guide is 10° (psc).

You wish to take position bearing 70° (psc) from the guide, which means that the guide is to bear from you 250° (psc).

When you start from your initial position the guide bears 220°. As you steam out towards your new position, this bearing gradually increases. When it reaches 230° execute

B

Distance from Track of Guide to Turn	
Degrees Turn	Dist. from Guide
10	50
15	80
20	100
30	170
40	260
45	315
50	360
60	450
70	550
75	600
80	650
90	740
100	815
110	900
120	950

C

Table of Sines	
Angle	Sine
10	1/6
15	1/4
20	1/3
30	1/2
45	7–10
60	7/8

D

Distance Per Min. Steamed	
Knots	Yards
1	33.3
2	66.6
3	100
4	133
5	166
6	200
7	233
8	266
9	300
10	333
11	366
12	400
13	433
14	466
15	500
16	533
17	566
18	600
19	633
20	666
21	700

Fig. 3 (Tables B, C, and D)

the turn to resume base course. You will lose 20° in the turn and end up with the guide bearing 250° (psc).

If you are taking position 3,400 yards distant, and using the same speed, the table shows that for the same turn you will lose 10°; 4,000 yards distant, 8½, etc.

9. The results obtained from the use of these tables have been most satisfactory. Reference to them eliminates the usually disastrous guesswork, and results in a great saving of time, coal, and effort. They are constructed for the same speeds of guide and maneuvering unit, which is the general case.

10. For different speeds of guide and maneuvering unit additional tables can be constructed, but it is not considered that this is desirable as the same speeds generally are used, and these tables will greatly assist in judging all cases, whether the same or different speeds are used.

11. Table "B," Figure 3, is very useful for turning astern of the guide. It shows how many yards from the *track* of the guide to execute the turn, in order that you may follow astern. Its use is as follows:

(a) Lay off the astern track of the guide (which occupies the center of the mooring board.)

(b) Lay off a line parallel to this track, and at a distance from it equal to the distance given by Table "B" for the turn you are to make. As you approach this line, plot your positions as given by range finder and compass, and when your plot falls on the line, execute the turn.

12. This will put you in correct position astern of the guide, and the division ahead having turned inside or outside will not mislead you.

13. Table "C" is simply a table of sines; Table "D," a table of yards steamed per minute at different speeds.

14. Their uses are illustrated in the same problem, as follows:

Say you wish to gain 1,000 yards towards the flank. If you change your course 10°, the sine of which is 1/6, steam 6,000 yards, then return to the course.

Table "D," which needs no explanation, aids you in determining how long it takes to steam this distance.

Should you change course 30° instead of 10°, steam twice as many yards as you wish to gain towards the flank. This because the sine of 30°, as shown by the table, is 1/2.

15. It may appear that the range finder is all that is necessary for this problem, but in actual practice it often happens that as soon as you turn out the range finder in use will not bear, in which case the tables are invaluable.

MOORING BOARD

16. The extremely simple method of the mooring board originated by Rear Admiral Burrage, and described below, is especially recommended for use during maneuvers. All who are interested in the mooring board, or who expect to become so at a future date, might well try it out and save this article for future reference.

17. It is believed that the Navy in general is not familiar with this method, which can be used with great ease in any mooring-board problem. Officers, especially navigators, now using other methods, might well investigate this one and consider using it in the future. It is as follows:

Knowing speed and course of guide and the point you wish to reach:

Place the parallel ruler (or the arm of the Universal Drawing Instrument) through the point you now occupy (obtained by compass bearings, and range finder or stadimeter reading) and the point you want to reach. (These may be any two points on the mooring board.)

Slide the ruler (or arm) to the point ahead of the guide representing his course and speed and draw a line.

Now, the point where this line cuts the circle representing the speed you are going to use indicates the course you are to steer.

18. As the course to be taken depends on the speed to be used, you have a number of combinations of speed and course from which to choose.

19. To illustrate, see Figure 4.

Guide at *C* making 12 knots, steering 60°.

Range finder and compass bearing show you to be at *A*.

You wish to reach *B*, 2,000 yards astern of the guide. (Scale 1″=1,000 yards.)

MOORING AND MANEUVERING BOARD

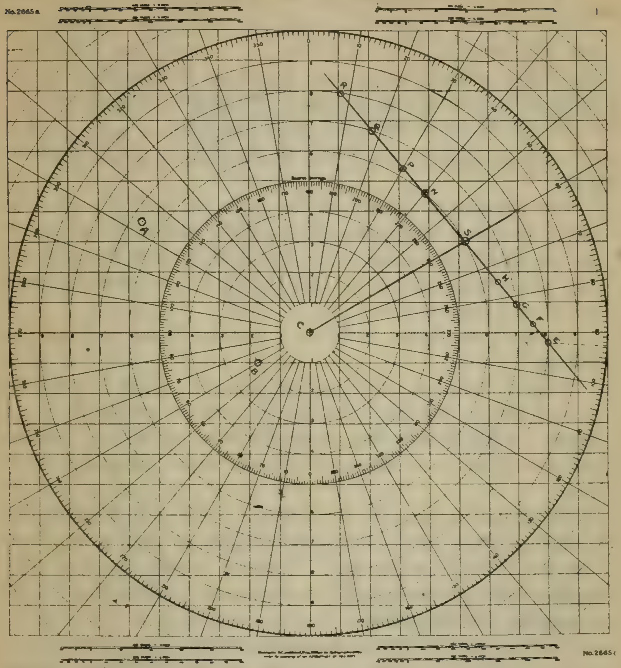


FIG. 4

Your maximum available speed is 16 knots.

Mark the point *S*, which represents the course and speed of the guide (60° being the course of the guide and 12 knots his speed, speed scale doubled. Circles represent speed. Speed scale is arbitrary and independent of distance scale.)

Place the parallel rulers through *A* and *B* (*where you are and where you want to go.)*

Slide the ruler up to pass through point *S*, and draw a line.

This line cuts the 16 knot circle at the point *E*, which, projected radially on the outer degree circle, represents the course you are to take, (92-1/2°), if you want to use 16 knots.

Or you may use course 88° at 15 knots (point *F*), course 82° at 14 knots (point *G*), course 75° at 13 knots (point *H*), etc., all shown by this single line.

20. Thus with only one line drawn on the board, we have a wide field from which to choose our course and speed. In certain tactical situations this is most important.

21. Let us suppose you are at *B* and wish to reach *A* (same figure).

The mechanical solution is the same (in fact, for any two points on a line drawn through *A* and *B*), but since in this case we are to change course to the left instead of to the right we now pick off our course and speed to the left of point *S* instead of to the right as before.

On the same figure, to the left of point *S*, we find the following:

Point *N* indicates course 40° at 12 knots. Point *P* indicates course 30° at 12.6 knots. Point *Q* indicates course 18° at 14 knots. Point *R* indicates course 8° at 16 knots, etc. Choose the one that suits your fancy or the particular conditions existing.

For instance, you may be leading a division at *B* which has to reach point *A*, and which is now in line of bearing 150° left, speed 14 knots, course 30°. You can change speed to 12.6 knots, which agrees with the present course, rather than change course in this formation.

Or you may be leading this same division in column, at 14 knots, course 30°, when it may be simpler to change course, without signal, 12° to the left to course 18° rather than to change speed.

22. In some cases it will be found that the line cuts certain speed circles twice, in which cases for a certain speed you will have two courses from which to choose the most suitable.

23. Described below is a modification or reversal of this method, often used in maneuvers:

Suppose you are in command of a division of a fleet on course 60°, and maneuvering at 12 knots. You now occupy a position, *F*, Figure 5, 1,700 yards 45° on the starboard bow of the guide division. (If convenient see bottom figure on page 38 of Standing Order No. 2, for this problem.)

Suppose further that you are to take a position *B*, abeam of the guide division, and 1,700 yards distant.

While the guide continues on course 60° at standard speed you are going to turn right, say 60°, to lose a certain amount of bearing, *and then left to course* 30° *to arrive at point B*, where you resume the base course.

You are going to use *standard speed* in changing your position.

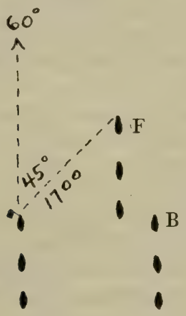


FIG. 5

Now the thing to be determined is, *when to change course left to 30° for your run back toward the guide.* (The course you use in the initial run out makes no difference in the problem.)

24. This problem is of frequent occurrence and has been considered difficult to execute. The solution below is extremely simple and accurate, while the "time method" solution has been found to be most unsatisfactory.

25. See Figure 6.

You are at point *F*, and wish to go to point *B*.

The speed of the guide division is standard, which is 12 knots, the course of the guide 60°. This gives us the point *S* (speed scale doubled).

26. The mooring board operator is principally concerned with the fact that, after your initial run out, *you are going to run in on course* 30° *with standard speed* (12° *knots*).

MOORING AND MANEUVERING BOARD

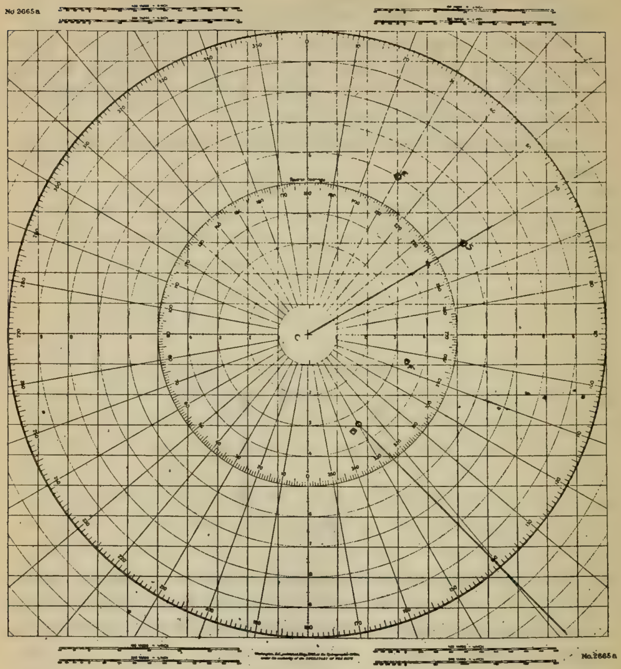


FIG. 6

He already has marked on the board:

(a) Point *C*, at the center of the board representing the guide.

(b) Point *S* representing the course and speed of the guide.

He now marks point *B*, at which you wish to arrive, and point *E*, which represents the course and speed you are going to use when, after your initial run out, you turn back to approach point *B*.

He lays his ruler through points *E* and *S*, backs it down to *B* and draws a line.

Come to the course 30° when you will swing onto this line in so doing.

NOTE: The range finder and compass plots show your approach to this line, and when you plot just above it, it is time to come to the course 30°. It makes no difference what point of the line you strike as any point on this line corresponds to point *A* in the Burrage method described above, of which the "answer" is point *E*.

27. Should a later plot show that you missed the line, or having hit it, that you had got off, the mooring board operator gives you a correction by using the method originally described above, i. e.:

Places the ruler through the present plot and point *B*, slides it to *S*, draws a line and picks off new speed or new course depending on which it is more convenient to change.

In line of bearing a change of speed probably would be more convenient; in column, a change of course.

(For other cases where this solution is used, see pages 38, 41, 66, 67, 68, etc., of Standing Order No. 2.)

28. It will be noted that in some cases after getting on the line you steam parallel with the guide before turning in. As long as your speed is the same as that of the guide, this makes no difference. Should it be other than that of the guide, allowance must be made for the distance that will be lost while steaming parallel to the guide. This allowance, as well as the allowance for the distance you are due to lose in the turns, is best made by drawing the line to pass ahead of *B* a distance equal to the loss.

29. With this easy and accurate method available, there is small excuse maneuvers of this class occasioning trouble or delay. Its application is easier and infinitely better than guesswork, and the problem requires less than ten seconds of time for the average mooring board operator. The line generally is drawn before the signal for the maneuver is executed by the flagship.

DISCUSSION

Personnel

(See Whole No. 235, Page 1507)

Captain J. K. Taussig, U. S. Navy.—The reading of Lieutenant Henning's paper titled "Personnel," which was published in the September number of the Proceedings, has awakened in me some thoughts which have been slumbering for quite a while and which required a stimulant like this article to arouse. Personnel being a hobby of mine, due perhaps to the fact that the greater part of my shore duty has been intimately associated with its administration or training, it is perhaps natural that I should be conquered by an uncontrollable desire to discuss Mr. Henning's paper. At least this is my excuse for doing so.

Taking the sub-heads in the order in which they were treated we will first take up "Permanency of Personnel."

It is generally recognized throughout the service that permanency of personnel is a great asset for efficiency, and that due to this lack of permanency we never get beyond the elementary stages in training. In fact *all* ships are practically training ships, not for the higher and more intricate phases, but for the elementary work. Mr. Henning says the first step to remedy this is to: "Make the first enlistment six years." This undoubtedly would have a salutary effect on permanency. It is not the first step, but the second step. The first step necessary for permanency of personnel is *adequacy of numbers.* This, insofar as my personnel experience extends, has never been our fortunate position, excepting during the actuality of war, when, to a large extent the advantage in quantity was largely discounted by the disadvantage of quality. We have never had a proper balance between material and personnel, and the personnel has always been on the light side of the scales. Take for example our present situation where we are allowed 86,000 men. To run properly our navy on a peace time basis requires no less than 130,000 men. With such a shortage it is natural that two great defects are apparent in our personnel distribution. One is that many of our first line ships have no crews at all, and the second is that for those which have crews, there is no reserve for replacements. Now we would not think of not keeping a proper reserve of stores, supplies, fuel, and provisions with which to replenish our needs. But the idea of having a small reserve of men to take the place of those who are sent to hospitals, or of those who are discharged for various reasons, or desert, somehow or other seems preposterous! Our reasoning in general in regard to shortage of personnel both in individual ships and in the navy as a whole is not usually sound. Instead of ships in commission being short of their regular complements, they should have men in excess, especially in the Chief Petty Officer and

Petty Officer ratings. It is these men who must be used as the nucleus for newly commissioned ships in case of war. We must realize that unless there is a decided improvement in our naval reserve affairs, that organization has practically become defunct. Its existence is on paper only.

As for the six-year enlistment term, there is no question but that this would be an excellent thing for the service in just as great proportion as the two-year enlistment was a terribly bad thing. Even with shortage in personnel, the six-year enlistment would add to permanency. But in going after the legislation necessary to obtain this lengthened enlistment period, we must not forget that congressional psychology is at present against it. In other words, instead of asking for legislation which calls for the first enlistment period hereafter to be six years, let us ask for legislation which permits the Secretary to make enlistments for six-years in addition to those terms that are now authorized. The chances are much better for getting the legislation in this form than in the other. It would then be in the province of the Department to authorize enlistments only for six years, and this would be done whenever the navy is recruited to its authorized strength, a condition which should be normal as soon as we once attain normalcy.

Lieutenant Henning's remarks about the continual transfer of officers and men from ship to ship, likening them to "birds of passage," are well made. There is altogether too much of this. But the remedy is not in the measures advocated by him. In fact so long as the four-year enlistment is in force and so long as we have inadequate numbers of men for the ships in service, the proposed remedies are impracticable. The first two of these measures are:

"(1) Allow no transfers *to* ships of the first line of men having less than three years to serve, and

"(2) Permit no transfers *from* ships of the first line until after three years service on that vessel except under exceptional circumstances which must be referred to the Department."

The present conditions as to number of men in proportion to material and as to length of enlistment period are not so very different from what they were shortly prior to the war. At that time the *Texas* was to be commissioned. The Chief of Bureau of Navigation directed that no men should be placed on the *Texas* detail with less than *two* years to serve. *This order could not be carried out.* Owing to the large number of ships in commission in proportion to personnel there was no reserve available to fit out even a single ship with men having two years remaining on their enlistments. It could not be accomplished without taking a number of two-year men from ships already in commission, and it was manifest that if this were done there were no long time replacements for these men, and the instability of *all* these ships was increased thereby. So long as we live from hand to mouth in personnel, ships fully manned with long time crews are impracticable. The only remedies are the six-year enlistment and adequacy of numbers.

Under the heading "Training Station Experience," Mr. Henning writes: "The training station period for every man should be six months, including a three months training ship cruise." This would be an ideal theoretical condition. But is it good under the present practical conditions? For example, is it desirable to place in commission a number of training ships when there are a lot of real fighting ships without crews? To place training ships in service means a further depletion of the fighting ships. It means more training for the recruits but less for the rest of the navy. There should be a proper balance somewhere, but it would seem that so long as we are below our needs in total enlisted personnel we can not afford to sacrifice the fleet training for purely recruit training. Under present conditions as to numbers and length of enlistment period, I believe it better for the navy as a whole to send the recruits direct to the regular fighting ships after a three or four months period at the training stations.

Many of the things Lieutenant Henning says about "Military Standard" are, unfortunately, true. However, he paints the picture a little worse than it has been my experience to see. We should have the same military standard on all ships throughout the service. This is far from so. On the inspection reports of a ship, the flag officer is required to answer the question: "Is she entitled to be called a 'smart ship'?" The answer to this question has, in my experience, usually been decided more or less on the military standard than on the naval standard. There is a difference in the life of a soldier and a sailor. The environment is different, and certainly the work is different, although the ultimate aim of both is fighting efficiency. When it comes to rigidity of action and manner as exemplified by the military standard, I do not believe that life on board ship is conducive to it in the same degree as on shore. While at quarters and at drill, these military standards should be adhered to, but at other times there are certain naval standards which permit of a let down in rigidity and which I believe broaden the man.

Perhaps one of the causes in our failure to maintain a proper military standard, is the sailors' uniform. There is nothing military about it, and if there is any truth in the adage that, "clothes make the man," I do not see how we can expect to keep up a high military standard so long as we stick to our present antiquated and unmilitary uniform. It is recognized that a uniform is necessary for the attainment of military standards, so if we are slack in these attainments let's make a change and put our men in sensible clothes, and give them a proper cap to wear instead of the ridiculous white hat which shrinks until it just sits on the crown of the head, and the big brimmed flat hat which the least puff of wind blows off. Some years ago we changed the Chief Petty Officers' uniform from the old-time sailor style to the present neat affair. Let us give the sailormen something similar and we will find it much easier to maintain military standard.

In Lieutenant Henning's discussions on "Physical Training," and "Morale," he brings out many pertinent points that are worthy of con-

sideration and putting into practice. It will be noted that the time element enters into nearly all of these, and while an hour here and an hour there seem in themselves small, when we take into consideration the very many things that must be done on a man-of-war, they all total up to goodly proportions. We will have more time to spend on physical training, exercises, and instructive lectures, etc., if we succeed in getting beyond that perpetual elementary training state, which can only be accomplished when we get adequacy in numbers together with the six-year enlistment period.

His suggestions about employing the moving pictures for instructing the men in naval history is an excellent one. There is no question but that the periodic replacement of some very poor films now shown, by some that instruct concerning the past history of the navy would have a salutary effect on morale, in that it would tend to improve the *esprit de corps*. It is to be noted that the Bureau of Navigation recently sent to all ships a series of copies of paintings depicting notable scenes during the late war. This is somewhat in line with Mr. Henning's suggestions.

The effect on military standard and morale as exemplified by the manner in which Chief Petty Officers and other Petty Officers perform their military duties is worthy of consideration. Especially is this so where it concerns discipline. Our difficulties along these lines vary according to different ships. It has only been in recent years that we have abolished the rating of master-at-arms. As long as there had been a navy we had had a separate police force for maintaining discipline. Neither the army or marines had such a force. All non-commissioned officers were trained to understand that they were a link in the maintenance of law and order. But in the navy it came to be looked on as a function of "jimmy legs" only. As a result our petty officers became such for professional duties only—they were neither trained nor qualified for military duties.

Even now many of our Petty Officers are appointed entirely on their professional qualifications. We have many petty officer ratings where the incumbent has practically no military duty to perform. They do not control or command other men. In other words, they are officers in name only. The navy regulations provide for their assisting in the maintaining of discipline, but there are no men under their authority. Having this large number of so-called Petty Officers who have no command duties naturally detracts from the value of the others in their military capacities. The remedy would be to have a re-classification in which men who have professional qualifications deserving high rates of pay, but who have no military command, be known as rated men, rather than Petty Officers, and have some distinctive mark other than the Petty Officer rating badge. Then the real Petty Officers could much more easily be made to appreciate the significance of their titles. We can not expect the real Petty Officers to have an appreciation of their military duties so long as we take men into the service from civil life, and make them Petty Officers before they even know what it means to obey orders themselves.

Lieutenant Henning's description of the chaotic situation which existed during mobilization at the beginning of the war, is in no wise exaggerated. In fact these conditions were in many respects even worse than he sets forth. All of which was due, of course, to our lack of preparedness.

We had a Naval Reserve law which had failed to accomplish its intended purpose, so that at the beginning of the war our reserves amounted to almost nothing. Then when war actually came, the reserve force grew with leaps and bounds until it contained over 300,000 men and women. The men who enrolled in the reserves did so simply because there was a limit by statute on the size of the regular navy, and no restriction on the number of reserves. These three hundred thousand so-called reserves were reserves in name only. In reality they were untrained regulars. To quote from "A Study of Our Navy Personnel Situation," published about a year ago in the PROCEEDINGS:

"In other words our present reserve force did not come into existence because of the possibility of war, but because of the actuality of war. As certain as this organization found its creation because of the war, just as certain will it find its death because the war is over. It cannot be saved unless the laws are changed, and unless we come to appreciate the fact that the only reserve that should be maintained in time of peace is one that is at all times qualified for sea service."

We have witnessed the passing of the reserve due to natural attrition, lack of funds, and the general defects in the original law. The laws are from time to time being changed; but under present conditions there is no chance of our having an effective reserve that would permit of an immediate mobilization of even one-half the ships we would wish to place in service. How best to organize such reserves as we have, and how best to provide for an efficient mobilization plan are of vital importance. Unless the reserves are well organized, and unless there is a good mobilization plan, it would be just as well not to spend any money whatever on the reserve force.

I can see no reason why both the organization and mobilization plan should not be effective and efficient under the direct control of our Naval District Commandants, provided sufficient funds are available. These Naval Districts have the machinery for making the plan effective and are now prepared for immediate expansion in case of war. This condition did not exist prior to the late war. I think Mr. Henning's proposal to make each ship accountable for its own reserve, entirely impracticable. The status and stations of our ships are changing too rapidly to make this plan feasable. The destroyer *Dent* may be "based at Philadelphia with reduced complement" today, but tomorrow the *Dent* may be enroute to Asiatic waters, or she may be in full commission or out of commission. Each change of status would require a shift of the reserve personnel and a distribution of them perhaps to several ships. In this kind of a plan there would be no organization for caring for the greater part of the reserves which must be in readiness for placing on board the fighting ships which are out of commission. It seems to me

that our "complex organization heretofore attempted, the Naval District idea," is simplicity itself in comparison with Mr. Henning's suggestion. There are many complexities in Mr. Henning's plan which would not be apparent to one who has not had experience in the actual administration of large bodies of men. Decentralization of authority may be good to a certain extent, but to carry it out to the limit contemplated, could not result in anything but chaos. The idea of each ship having its own reserve force, controlled by itself, cannot be a success for many reasons. But the chief of the reasons are that the status of ships changes too rapidly, and the men for each unit would be too widely scattered. In addition it has been found to be very bad practice to have any man in the naval service consider that he is enlisted or enrolled for a special detail only. All men in the navy, whether regulars or reserves, must be available for duty on any ship and any station the Department sees fit to send them.

Mr. Henning, in his discussion of where the reserve is to be used, says: "It can not be too strongly urged against filling up the complements of the battleships of the first line with reservists." Why only battleships? Why not *all* the ships of the first line? With what are we going to fill up the complements of the battleships if we don't fill them with reservists? There is no reserve of regulars. The only other way the battleships could be filled by regulars (and they would all require filling), would be to take the men from the cruisers, destroyers, and auxiliaries, thereby further depleting their already depleted complements. But would we do this in case of war? Manifestly not, and for very good reasons. The cruisers, destroyers, and auxiliaries will be the ships whose services will be first required in operations against the enemy. Both the cruisers and destroyers are very much more likely to see active fighting than are the battleships. The cruisers and destroyers will undoubtedly see some such service, but the battleships may never have an engagement. We could not afford, at the beginning of a war, to deplete these cruisers and destroyers of their regulars, and send them to the battleships. No, it looks now that in case of war again we would go through the same process as the last time; that is, deplete our battleships of trained men in order that certain other ships may immediately operate. The battleships can probably better take weeks or months to absorb the new material than could the cruisers and destroyers. This of course is not as it should be; but I do not see how under the present conditions, where we have neither an adequate regular personnel or reserve force, it could be helped. We will simply be facing the facts as they exist, and have to take our medicine no matter how unpalatable it may be.

Employment and Tactics of Aircraft in Naval Warfare

(SEE PAGE 1263, WHOLE NO. 234)

LIEUTENANT R. G. PENNOYER, U. S. NAVY.—Commander Jackson has given the service an excellent idea of the "Employment and Tactics of Aircraft in Naval Warfare," and in view of the fact that his article is one of the first and most exhaustive ever written on this subject for the benefit of the Naval Service, it is of particular interest and value.

The author has been careful to state in his footnote that since the author is not an aviator, many of the statements in this article regarding conditions in the air have been taken from the expert opinions of aviators. Undoubtedly these advisers have been heavier than air pilots, and from the standpoint of the heavier than air pilot there is very little in this article to criticize.

On the other hand these advisers have had very little if any experience with lighter than air craft, particularly rigid airships, and in consequence the author has made a very bad case for this type of aircraft.

In paragraph 15 he states, "The largest dirigibles must above all have endurance and ability to keep the air under adverse conditions of weather. Their speed and climbing power are moderate." To state that the speed of this type of craft is moderate is quite true if one compares their speed with that of a fighting plane; on the other hand they have a full speed over twice as great as the speed of our fastest destroyers, a cruising speed of two and one-half times the cruising speed of a destroyer, and a full speed of about eighty-five per cent of that of a large scout seaplane. Furthermore, the statement that their climbing power is moderate is entirely inaccurate. Experiments to determine the rate of climb of rigid airships, made by the German Navy during the late war, gave in one instance a climb of 3,250 feet per minute, and all craft of this type are capable of climbing 20,000 feet in ten minutes without difficulty. I am safe in declaring that no airplane in our navy or in any other navy is capable of such a rate of climb. The ability of an airplane to climb falls off rapidly with increase in altitude, whereas altitude makes no difference in the climbing of a rigid airship.

In paragraph 16 Commander Jackson makes the following statement, "Dirigibles can operate only from the shore, and therefore cannot be counted on for reliable use with the fleet. This was demonstrated at the Battle of Jutland, by the failure of the German Zeppelins, in spite of the proximity to their bases at which the action took place." The first day of this battle was undoubtedly a failure on the part of the Zeppelins, brought about by the adverse weather conditions (fog) existing at the time, and although four Zeppelins were out they were not of much assistance. Eleven Zeppelins did, however, go out on the second day and assist the High Sea Fleet in regaining its base without loss. Since the Battle of Jutland the British have perfected the mooring mast which makes the rigid airship independent of all except the worst possible weather, which

in this respect certainly places the rigid airship on a par with any other type of aircraft.

In this connection the mooring mast experiments carried out with an obsolete underpowered type of airship, H. M. A. *R-33*, at the British Airship Base, Pulham, England, will probably be of interest:

Number of days at the mast	111
Number of flights from the mast	50
Number of night landings at mast	4
Hours flying	171 hours 9 min.
Maximum wind on leaving mast	40 m p h
Maximum wind on landing at mast	26 m p h
Maximum wind experienced while moored	55 m p h
Maximum wind experienced during flight	50 m p h

Heavy rain, hail, snow and thunder storms were experienced with the ship riding readily at the mast.

In addition to the above, work like changing engines, removing and replacing gas bags, and repairs to outer cover were carried on. Naturally operations like refueling, gassing, etc., were also carried on at the mast. As a result of these experiments the Navy Department has erected a larger and more efficient type of mooring mast at the Naval Air Station, Lakehurst, N. J. With such masts erected at all Fleet Bases, rigid airships can certainly be depended upon for "reliable use with the fleet." The next step which naturally suggests itself is the erection of a similar mast on a special aircraft carrier. It is suggested that an obsolete battleship could be taken for this purpose, and the foremast readily converted into a mooring mast, and thus a mobile base for rigid airships obtained. Mooring masts for rigid airships are a fact, and are outside of the experimental state. The application of mooring masts to surface ships, is a suggestion which the writer believes is entirely sound and practical.

As a matter of fact rigid airships can be towed by ships much more readily than can kite balloons, and in good weather gassed and fueled as kite balloons are today. During the war a German rigid, the *L-23*, actually landed on the water alongside of a merchant ship and put a prize crew on board, after which the ship was successfully navigated into a German port.

Paragraph 41 states, "Seaplanes are in existence with a radius of 1,200 miles." If the author means by radius the total distance the seaplane can fly before refueling he is quite correct, but on the other hand the total distance this type can perform scout duty is only one half of this distance, or 600 miles. This distance would be increased a bit if the seaplane were scouting ahead of an aircraft carrier or tender, by the distance covered by the tender, possibly 250 miles additional. On the other hand rigid airships are in existence with a scouting radius of over 3,500 miles, capable of flying a total distance of over 7,000 miles without refueling, and this at a speed of over 50 miles an hour. The *L-72* for instance, now in the possession of the French, was designed for the express purpose

of bombing New York. It is readily seen the tremendous areas aircraft of this type are able to cover in a short time. The author further states that dirigibles cannot be employed in the face of effective aerial opposition. No more can these comparatively slow moving scouting seaplanes. They are no more of a match for fighting type of aircraft than is the rigid airship. The latter can depend upon its climbing ability to keep away from pursuit planes, and can also carry a fighting plane for defensive purposes. On the other hand the only defense a scouting seaplane has against pursuit planes is to land on the sea, such that the fighting plane will not be able to dive downward on the seaplane delivering machine-gun fire directly at the sea plane, but must be content with rapid maneuvering and fire at the sea plane while stationary on the water. It is easy to see the great disadvantage at which the sea plane is placed. Commander Jackson has stated that due to the comparatively low speed of the scouting plane it would not be able to escape when discovered by enemy fighting planes out of supporting distance of its own fighting planes. In this respect the rigid airship is quite superior since it can depend upon its superior climbing ability to escape.

On the other hand it is not expected that effective aerial opposition will be met with, except by chance, until in the vicinity of the enemy surface forces. It is true that a rigid airship is not as easy to conceal as an airplane, but certainly it should be able to see as quickly as she is seen, and then depend upon her superior climbing ability to escape, and her powerful long range radio equipment to get information to the Commander-in-Chief. The position of the enemy forces thus obtained will be much more accurate than where obtained from scouting planes. Commander Jackson is quite correct when he states, "Astronomical observations are difficult to take and untrustworthy due to the inaccuracy of estimating the height of eye, and the discomfort and exposure of the observer," provided that he is speaking only of heavier-than-air craft and small dirigibles. The navigation of rigid airships presents problems not greatly in excess of those found on a destroyer or submarine. The navigator works in a closed comfortable cabin, and by the use of accurate bubble or pendulum sextants (now on the market), he can make observations any time day or night and not have to depend upon a horizon or height of eye, with an average error of about ten miles, and at the worst certainly not more than twenty miles in error.

Again in paragraph 62 the author states, "The difficulty of maintaining large rigid dirigibles with the fleet far from their shore bases would practically preclude them from this duty," (protective scouting). I have already stated the means by which these craft may be maintained with the fleet, that is, by mooring masts at all fleet bases, by a mooring mast installed on a surface ship, or simply by towing from a surface ship as a kite balloon is towed. The difficulties are no greater, if as great, as the present difficulty of maintaining kite balloons with the fleet.

The author has stated that, "In any case it cannot be seen that dirigibles possess any greater advantages over surface craft for protective scouting

except speed and greater radius of vision due to their higher altitude." After all is said and done are not these the two most important considerations? Then again he states that, "against aeroplanes they would be helpless." I admit that in case the rigid dirigible remained stationary and permitted the enemy aeroplanes to come up and shoot at her, it would very probably prove disastrous for the airship. On the other hand the safety of the airship depends upon its climbing ability. The pursuit planes at present in use in our navy have a maximum rate of climb of 15,000 feet in twenty-four minutes and a ceiling of 20,000 feet; against this a rigid airship can climb 15,000 feet in seven minutes and has a ceiling of 25,000 feet. The answer is quite obvious.

The purpose of this discussion has not been to detract from the aeroplane, for Commander Jackson has very ably presented its case, but on the other hand I have attempted to show the value of the rigid airship.

REPORT OF THE ANNUAL MEETING, 1922

In accordance with Article V, Section X, of the Constitution and By-laws, two weeks' notice having been given, the annual meeting was held at 8:05 P. M., on October 13, 1922, in the Board Room of the Officer's mess, U. S. Naval Academy.

Rear Admiral Henry B. Wilson, U. S. N., Vice-president, presided.

The minutes of the last meeting were approved.

The first stated business being the election of officers, the appointed tellers, reported the votes as follows:

	Votes
For President:	
1. Rear Admiral B. A. Fiske, U. S. N.	358
2. Admiral E. W. Eberle, U. S. N.	195
3. Rear Admiral S. S. Robison, U. S. N.	137
For Vice-president:	
1. Rear Admiral William V. Pratt, U. S. N.	655
For Secretary and Treasurer:	
1. Commander C. C. Gill, U. S. N.	606
2. Commander J. S. Woods	91
For Board of Control:	
1. Captain John Halligan, Jr., U. S. N.	503
2. Commander W. R. Van Auken, U. S. N.	456
3. Commander H. D. Cooke, U. S. N.	450
4. Brigadier General George Richards, U. S. M. C.	449
5. Commander John Downes, U. S. N.	438
6. Captain J. A. Furer, (CC) U. S. N.	364
7. Captain R. M. Watt, (CC) U. S. N.	313
8. Captain H. E. Lackey, U. S. N.	255
9. Commander J. O. Fisher, U. S. N.	210
10. Commander G. S. Bryan, U. S. N.	207
11. Lieutenant Commander A. D. Denny, U. S. N.	164
12. Commander H. G. S. Wallace, U. S. N.	150
13. Lieutenant Commander J. A. Murphy, U. S. N.	89

The chairman then declared the following officers elected for the ensuing year:

President: Rear Admiral B. A. Fiske, U. S. N.
Vice-president: Rear Admiral W. V. Pratt, U. S. N.
Secretary and Treasurer: Commander C. C. Gill, U. S. N.

Board of Control: Captain John Halligan, Jr., U. S. N.
Commander W. R. Van Auken, U. S. N.
Commander H. D. Cooke, U. S. N.
Brigadier General George Richards, U. S. M. C.
Commander John Downes, U. S. N.
Captain J. A. Furer, (CC) U. S. N.

The following remarks were submitted by the Secretary:

MEMBERSHIP

There are at present 4,835 members, of which three are honorary members, 144 life members, 4,164 regular members, and 524 associate members. Of these, about 375 have been suspended, either for not advising the Institute of changes of address, or for being in arrears for dues for two or more years.

The changes in membership during the year were as follows:

Resignations:		
Regular	394	
Associate	30	
		424
Deaths:		
Regular	25	
Associate	3	
Life	1	
		29
Dropped:		
Regular	347	
Associate	---	
		347
Total loss in membership		800
New members		147
Net loss in membership		653

FINANCIAL STATEMENT

In round numbers, the financial activities of the Institute for the year have been as follows:

The gross value of business receipts was:

Books copyrighted by the Institute	$40,600
Purchased books	3,200
Dues and subscriptions	11,360
	$55,160

The Book Department made a gross profit of $19,000. Operating expenses amounted to $18,500, leaving a net profit here of $500 for the year.

The printing of the PROCEEDINGS has involved a loss of $6,000 which is just about offset by interest on investments and bank deposits. During the last year, the PROCEEDINGS have been taken away from the Lord Baltimore Press and awarded to the Banta Publishing Company, in Wisconsin. The Lord Baltimore Press printed the first five issues at an average monthly loss of $875. The remaining seven issues were printed by Banta at an average loss of $230. This change in publishing houses shows a saving to the Institute of between $7,500 and $8,000 per year on printing the PROCEEDINGS at present prices.

In spite of this saving, the publication of the PROCEEDINGS still involves a monthly deficit that is a heavy tax on the resources of the Association. As this deficit can best be overcome by an increase in the membership roll, the loss of 653 members during the last year is a serious matter. However, the gradual decrease in membership during the last few years may be looked upon as an aftermath of the war. Earnest effort is being made to counteract this, and there are encouraging signs that it will soon stop and the tide turn the other way. If the Service will give the Institute a little more support it will not be necessary either to curtail the PROCEEDINGS or to increase the yearly dues.

Fortunately, the Institute is in sound financial condition. Considering our total income and total expenses during the past year, the increase in net worth is $1,500. The net worth of the Association on September 30, 1922, was $176,867.03.

PROCEEDINGS

In carrying out the object of the Naval Institute: viz., the advancement of professional and scientific knowledge in the navy, the most important activity of the Association is the monthly publication of the PROCEEDINGS. Endeavor is constantly being made to increase the usefulness of this magazine to the Naval Service.

It is aimed each month to present to our readers a balanced assortment of original articles on subjects of Naval interest, setting forth authoritative discussions of Naval policy, Naval

administration, Naval science, and Naval history. As the Institute depends almost entirely upon contributions from members of the Association, co-operation of all hands is necessary in this work.

The Professional Notes section of the magazine is an important feature. A recent change has been made by which two officers now work on the compilation of these notes; one on duty here at the Naval Academy, and one on duty in Washington. We now have a list of 180 periodicals of Naval interest. Of these, forty-seven of the most important ones are received here in Annapolis and gone over by Lieutenant Commander Rockwell. The balance are reviewed by the Washington compiler, Lieutenant Heffernan. There is thus produced a digest of current Naval thought, as expressed both at home and abroad, invaluable to officers desiring to keep abreast of their profession. Also a reference list indicating subject matter of articles of service interest, published during the month, is a part of this section.

The Notes on International Affairs have been prepared by Professor Allan Westcott, of the Naval Academy, since 1915, and by their established usefulness have become a fixture in the PROCEEDINGS.

The Board of Control has approved a policy to extend and improve the book review columns of the PROCEEDINGS. In this connection, the following suggestion has been made:

"The Naval Institute has a considerable library of professional books. There are also available, handbooks and reference books of various descriptions, as well as magazines and periodicals, both domestic and foreign. It is planned to extend and improve the review columns of the PROCEEDINGS and to publish promptly reviews of books on naval, professional, historical, and international subjects, giving authoritative information as to their respective scope and value. This will involve the collection of a valuable and complete library of current literature on topics of interest to the service.

"The Institute would be pleased to have the Naval Academy gain all possible advantage from this library. It is therefore suggested that if practicable, room "A," adjacent to the Institute offices, be assigned to the Institute for use as a library open to the Naval Academy teaching staff. If this is approved by the

Superintendent, the Institute will provide a reading table and chairs, and will also be glad to detail from its clerical force a librarian, to take charge of this library so that books may be drawn out, under similar rules and regulations as are in force in the Naval Academy Library."

This suggestion has been approved by the Superintendent, and steps will be taken in co-operation with the library committee to carry it out.

It has been the policy of the Institute, always, to do all it can to help the Naval Academy authorities to produce high grade textbooks on professional subjects taught midshipmen. In accomplishing this, the following considerations govern:

(a) That text and context be of standard that will reflect credit on the Naval Academy and the Service.

(b) That the best available talent be obtained to write or compile these books.

(c) That the midshipmen and the Service be given the benefit of as low a price as practicable on these books.

In carrying out this policy, the Institute has recently adopted a modified plan of procedure, whereby the midshipmen will be given the benefit of a more reduced price.

The new book on *Navigation,* the revised edition of *Elementary Mechanics,* and the *Manual of Athletic Requirements* have all been made under this new plan with satisfactory results.

The offices and books of the Institute are open to all members, and constructive criticism is welcome.

The above remarks of the Secretary were voted approved. (Details of the attending discussion may be found recorded in the annual minute book of the Association.)

There being no further business, the meeting adjourned at 9:15 P. M.

C. C. GILL,
Commander, U. S. Navy, Secretary and Treasurer.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 4,839.
New members, 24. Resignations, 4. Deaths, 5:

Rear Admiral Seaton Schroeder, U. S. N.
Rear Admiral C. E. Clark, U. S. N.
Lieutenant J. T. Pennycook, U. S. N.
Lieutenant E. L. Ericsson, U. S. N.
Lieutenant R. F. Armstrong, U. S. N.

Practically the whole service receives the benefit of the PROCEEDINGS, yet many officers who read it monthly are not members, and therefore contribute nothing to the support of the Institute.

The publication of the PROCEEDINGS involves a monthly deficit that is a tax on the resources of the Association. As this deficit can best be overcome by an increase in the membership roll, the loss of 653 members during the last year is a serious matter. However, the gradual decrease in membership during the last few years may be looked upon as an aftermath of the war. Earnest effort is being made to counteract this, and there are encouraging signs that soon the tide will turn the other way. If the Service will give the Institute a little more support, it will not be necessary either to curtail the PROCEEDINGS or to increase the yearly dues. *Members are requested to urge non-members to join.*

Dues The annual dues ($3.00) for the year 1922 are now past due.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid for at one-half the rate for original articles, or about $2.25 a page.

Articles

The Institute desires articles of interest to all branches of the service, including the reserve force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

The attention of contributors is requested to the difficulties attending the publication of long articles in the PROCEEDINGS. The number of pages in each issue is limited. Also, members have criticized the unbalanced effect resulting from the publication of long, discursive papers. It follows that compact, well digested articles are more likely to be accepted for early publication.

Book Reviews

As soon as practicable after the publication of books on subjects of professional interest, the Institute aims to publish authoratative reviews of them.

The Board of Control has authorized increased compensation for book reviews in order to improve these columns in the PROCEEDINGS.

Book Department

The Institute Book Department will supply any obtainable naval, professional, or scientific book at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books should be considered. The cost will not be greater and sometimes less than when obtained direct from dealers.

Attention is invited to the following books that are additional to those listed in our advertisement columns:

The Boat Book, 1920—price: 50 cents.

Landing Force and Small Arms Instructions, price: $1.00.

Principles Underlying Radio Communication, 2nd edition (comprising radio communication pamphlet No. 40, prepared by Bureau of Standards; revised to May 24, 1921 by Signal Corps, U. S. A.) price: $1.00.

Address orders to: U. S. Naval Institute, Annapolis, Maryland.

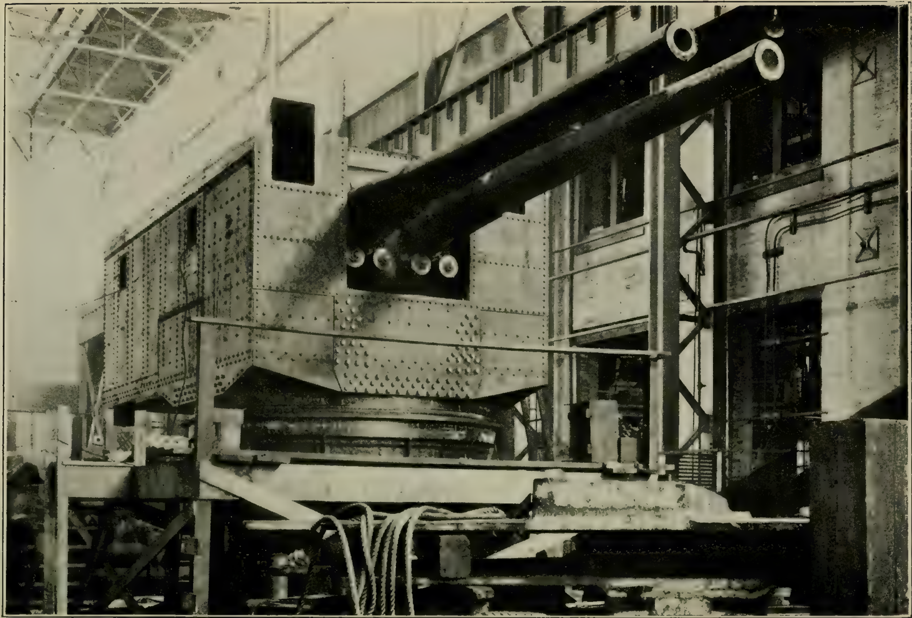
Address of Members

To insure the delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers notify the Secretary and Treasurer of every change of address without delay.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished can be greatly reduced if the reprints are struck off while the article is in press. Twenty copies of reprints are furnished authors free of charge. When the article is submitted, authors are requested to notify the Secretary and Treasurer of the number of additional reprints desired.

INFORMATION INDEX



Twin Six-inch Mount to be Installed on Scout Cruisers

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER F. W. ROCKWELL, U. S. NAVY

and

LIEUTENANT J. B. HEFFERNAN, U. S. NAVY

GENERAL ARRANGEMENT

FRANCE

New Construction.—The French Naval General Staff has announced that construction has begun on the following vessels of the 1922 program:

FLOTILLA LEADERS: (2,400 tons) *Jaguar* at Lorient; *Panthere* at Lorient. LIGHT CRUISERS: (8,000 tons), *Duguay-Trouin* at Brest; *Primauguet* at Brest; *Lamotte-Piquet* at Lorient.

Seaplanes on Hand September 30.—The Service *Central de l'Aeronautique Maritime* announces that the French Navy possessed the following planes on September 30, 1922:

AIRPLANES	Number
HANRIOT 80 hp. *Rhone* (for school use)	30
HANRIOT 130 hp. *Clerget*	12
BREGUET 300 hp. *Renault*	12
NIEUPORT 180 hp. *Rhone*	6
FARMAN bimotor 500 hp. *(Salmson)*	2
FARMAN bimotor 450 hp. *(Lorraine)*	2
Total	64

SEAPLANES	
F. B. A. 130 hp. *Clerget* with hull (For school use)	25
HANRIOT 130 hp. *Clerget* with floats (For school use)	24
FARMAN C. L. 300 hp. *Renault* with hull	100
FARMAN trimotor 1,000 hp. *(Sunbeam* or *Lorraine)*	2

LATHAM trimotor 950 hp. *(Sunbeam)*	....	6
LATHAM quadrimotor 1,000 hp. *(Salmson)*	....	2
	Total	159

FRENCH FOREIGN POLICY.—Probably no man in France was better equipped for discussing the foreign policy of France than was the late Senator Paul Deschanel. The following was prepared by Monsieur Deschanel for delivery in the Senate. He died before the date set for his speech and it is published now posthumously.

GENTLEMEN: I am asking certain information of the Government on our foreign policy.

First I would point out, in agreement with Messieurs Ribot, Doumergue, and Poincare, the disadvantages of diplomatic practices as carried on since 1919.

In all times past, under all régimes, absolute monarchy, committee of public welfare, directoire first empire, constitutional monarchy, we sent ambassadors accredited to foreign States and the ambassadors reported to the Minister of Foreign Affairs the results of conversations. The minister would then take up with the cabinet the matter to be examined. After deliberation in the cabinet the foreign minister would issue appropriate instructions to his agents (ambassadors or ministers).

This method had the advantage of affording several lines of retreat, time for study of a question, time to prepare well considered replies, and finally to grant concessions only at the highest cost to an opponent.

While it did not exclude interviews between heads of Governments, yet such interviews were prepared in advance and not left to impromptu conversations.

On one occasion a chief of State, Napoleon III, thought to treat directly with foreign governments. More than once he negotiated without the knowledge of his foreign ministers, and even in opposition to them, and in 1870, in the absence of his Premier, Emile Chiver, he demanded of William I certain guaranties which resulted in the breaking out of war.

This method of handling international affairs was resumed again in 1919.

New Diplomatic Methods

Three men, who became prominent because of their great services in the War, the President of the United States, the British Premier, and the French Premier (I omit the Italian Premier only because he confined himself almost exclusively to questions regarding Fiume and the Adriatic); these three men excluded from their deliberations people who had fought and shed their blood with us, Belgium, Serbia, Rumania, Poland, and Tcheco-Clavicia, as if these noble peoples had the right of equality only in sacrifice; they called them "States with limited interests," as if the heroic Belgium Army that stopped the invader at Liege had defended a limited interest; and without control of any kind, without official and authentic *procès-verbaux,* without heeding the warnings and counsels of the chiefs who had won the victory, they took it upon themselves to dispose in regal fashion, of France, Europe, and the world.

Whatever judgment be passed on their work, I claim it to be in formal contradiction with the principles of the Republic, with the democracy, and with the parliamentary system, and I claim that if we do not do our utmost to preclude the return of that method of conducting our foreign relations we shall be remiss in our duty to future generations.

In the last discussion of the budget for the foreign office, Monsieur Briand showed little enthusiasm for these new methods of procedure, saying only that they resulted from the treaty of peace. They are not a consequence of that treaty but have followed it. It is but natural that

those who have profited by these methods should cling to them; but I believe that, as regards France, every advantage is to be gained by returning as soon as possible to sure and normal diplomatic rules.

This is the advice also of certain English statesmen of long experience. On January 27, 1922, Lord Gray expressed himself as follows:

"Because I have criticized the supreme council I am said to advocate secret negotiations. * * * I have in no way spoken of secret methods. I have stood for the calmest methods, methods the most set. One may work in quiet without necessarily working in secret. * * * Do they think the new methods of the supreme council to be secret? And is it not time that there is more secrecy now in the present Government's method of carrying on foreign relations than formerly? * * * To-day we hear much of the supreme council, but there are no records kept of their doings. Under the old system there would be kept *procès-verbaux* of their conversations, and frequently these would be published by way of showing the course that had been followed. The new method followed to-day is to report the fact of a meeting between 'the French and British Premiers,' but without giving any account of their conversation. In the procedure of the present Government there is on the one hand too much limelight, and on the other too much secrecy."

The treaties resulting from the new method, such as that of Versailles, and those following it, control now and will continue for long years to control our whole policy. We must then, in order to know where we stand and where we are headed, determine most precisely the consequences of that policy.

The Legend of Our Militarism

We are charged in Germany, and, most remarkably, in England and the United States, with ambitious aims, even imperialistic ambitions. Is there, I ask, a single Frenchman who would repeat the fault committed by Germany in 1871, that of introducing German representatives into French assemblies? No; but the leaders who won the war believed that certain measures of security were indispensable in the common interest of the Allies; and, over and above that, they agreed with the members of the committee charged with the negotiations with such men as Messieurs Charles Benoist, Aulard, Bourgeois, General Bourgeois, Cherquet, Derus, Gallois, Larisse, Pfister, Seignobos, and our leading geographer, Vidal de La Blanche. I am unable to name all of them. Certainly, these men were not imperialists anxious for conquests; they were students, republicans, professors, who knew geography and history. Moreover they were in agreement with the people in the Rhineland who had been subjected against their wills to Prussian domination and who, in a series of noisy demonstrations, claimed their autonomy under Germany.

What were the arguments of the English representatives that rejected the opinion of generals, of professors, of the Rhine people, and what arguments did the French plenipotentiary oppose? We do not know. What we do know is that on the seventh of last February (1922), at the opening of the British Parliament the Premier declared that he had to reserve the left bank of the Rhine against the operations of French annexationists.

This is the whole question of our relations with England, or rather with the cabinet now governing England.

Twenty years before the celebrated visit of Edward VII to the Paris Chambers of Commerce, I wrote that the entente between France and England was a fundamental necessity in European politics, that their long quarrel over colonies had become an anachronism since 1870. I have always felt that greatest admiration for Great Britain, for her literary and scientific genius, for her institutions, for her men in political life. And as

for the statesmen who now directs her destinies, we cannot, without ingratitude, forget the great service he rendered the cause of right during the war. The unity of command, so long desired by our President and by our generals, was realized through his efforts, placing Foch in command of the whole western front.

There is one thing, however, which the English place above either the admiration or recognition they inspire, and that is the use of firm language such as they do not hesitate to use on every occasion.

No one is infallible, neither we nor they—none. But what enlightened Englishman, having in his mind any thought for the future, could pretend that when, in 1815, Lord Castlereagh put Prussia on the left bank of the Rhine, he had not laid seeds of serious complications for not only the peace of France, but for that of England as well? Only, Lord Castlereagh had a motive: Europe in turmoil for long years of Napoleon, British diplomacy sought to contain belligerent and conquering France by a warlike nation on her frontiers; thus does the abuse of power ever provoke similar reprisals.

And what enlightened Englishman, having in view not only the present but also the long perspective of history, would to-day uphold Gladstone for taking Lorraine from us in 1871, and placing Europe in a state of turmoil and uncertainty for well-nigh half a century?

But Gladstone had a reason—the secret negotiations between Napoleon III and Bismarck concerning Belgium and Luxembourg.

It is not we, however, who have menaced Belgium this last time, nor we who, after having deceived Belgium, covered her with blood and ruins.

If the English Government, which did not expect this aggression—I was convinced of this when visiting London in 1912—had spoken a little more quickly, William II would not have dared invade Flanders. And would not this word, spoken in time, have spared England and the world incalculable disasters?

And it is in the light of such facts that certain English people suspect us of unnamed ambitious designs, even of perfidy to them.

At Washington the British Admiralty presented the hypothesis that contemplated an attack of the English coast by our submarines. Some Americans and even some English were unable to suppress a smile at such a thought. But even if failing in our loyalty, would not our interests forbid our planning to separate ourselves from our neighbors? France and England need one another; they cannot do without one another. When our delegates in Washington finally grasped this point they were able to clarify the situation, but it is unhappy that they should not have had an earlier occasion for so doing. These prolonged silences made the American people doubt our intentions—this great people whom our fleet had aided so heartily to gain their independence.

France militaristic? Here are the figures:

Budget for 1922

	Expenditures (in francs)			
	Military	Naval	Aeronautic	Total
English	5,365,895,600	4,288,908,000	957,372,000	10,612,175,600
French	3,700,345,454	843,618,295	254,652,440	4,807,616,189

England's traditional policy has been to seek and maintain a balance among continental powers, to back the weak against the strong; the losers against the winners of a war. I have just shown that she has not always succeeded, and that, without so desiring she has more than once been responsible for menace and peril to the peace of the world.

However, she signed the treaty of Versailles. Should Germany violate the treaty it would be the greatest imprudence to deny the territorial guaranties provided in the treaty. For England, such a procedure would be quite a different menace than would be our submarines. In defending the common frontier, we are saving not alone our own country, but as well the liberty of the world.

If the two nations concluded an alliance, we hope it will provide against German aggression in Poland, for unless due precautions be taken as to this, the peace of Europe will be uncertain and precarious.

As to reparations, the supreme council, contrary to the treaty, has put itself in the place of the Reparations Commission in fixing the amount of the indemnity and the method of payments; whence the reduction of forty per cent in our credit, according to some, and fifty per cent according to others.

Eminent financiers, such as M. Ribot, Milles-Lacroix, and Cheron, speaking with full knowledge and authority have shown our economic situation in comparison with that of Germany, and what will be our situation if we do not require Germany to meet her signed obligations. Since the treaty did not specify either the amount or the methods of payments, the Germans are slow in finding the money for making payments, though they find it for their own profit and for the purchase of arms. But, with America demanding payments from us how can we satisfy them; if Germany does not first pay us? To take over control of Germany's finances is the only method of obtaining what is due us. Only when an inquiry has regulated this matter of reparations can the affairs of the world be set to rights.

Meanwhile the British Premier advances the proposition of a conference where French delegates are to sit as equals with men from Germany and with soviets, but which the United States will not attend.

Be it said to his credit, Monsieur Poincare asks precise conditions and guaranties; the treaties and the League of Nations not to be attacked; reparations to be treated separately from economic reconstruction of Europe; and lastly, Russia not to be admitted to discuss the policies of foreign States and the payment of debts.

These are excellent principles; only we know that the soviets, in order to attack industry and commerce, to get new material and to start the factories, are ready to sign anything put before them, even to give over their ports to international administration and police, saying to themselves that they can at any time take them back.

But while this might be to the interest of commerce, it does not hold so much of promise to holders of Russian securities. According to figures which are necessarily approximate, Russia's foreign debt is divided about as follows:

	Billion
To France	25
To England	19
To Belgium	3½
To Germany	3½
To Switzerland, Holland, and Scandinavia	5
To United States	2
Total	58

France has thus advanced twenty-five billion francs at par, on a foreign debt of fifty-eight billion, for the economic equipment and national defense of Russia, or about forty-three per cent of that debt. We must thus create an international organization for the control of Russia's commerce, in order to levy on her exports and imports the amounts due the holders of her securities, and in proportion to the holdings of her creditors. The question is if the Bolshevist Government will lend itself to such a proposi-

tion. There is no virtue in Lenin's confession of errors in his communistic efforts unless he were to accept this, and I doubt if he will.

FRANCO-AMERICAN RELATIONS.—The following is a translation of an article by Andre Tardieu, French deputy:

The reason why the United States, in financial and economic matters, is so distant from France is because we have done nothing to draw the United States near to us.

1. The return in the near future to Paris of M. Jean Parmentier, director of bonds, etc., in the bureau of the minister of finance, is not of much significance.

2. Mr. Parmentier went to Washington, not to treat with the subject of debts nor to discuss it. His mission simply consisted of presenting to the American Treasury an exact table giving the financial situation in France. This having been accomplished, the director will return to France and give an account of his mission. I cited the other day the opinion of Mr. Abbot, chief editor of the Christian Science *Monitor,* in his statement: "The politicians in the United States are fully aware that France cannot pay in gold, and if she pays in merchandise the American markets, already overstocked, will suffer greatly." They are aware of this fact, but no one dares to say so.

3. The great drawback in this whole affair is that there does not exist any solidarity of affairs between America and France, and consequently no one in New York or Chicago is interested in making any arrangements to facilitate payments.

4. I had hoped in 1918 to create this solidarity to endure for many years, but for reasons of internal politics I was unable to succeed.

5. It was in the middle of October, 1918, that victory was reasonably certain and the problem of reconstruction was already thought of. To me the financial aid of the United States was absolutely necessary to carry out any construction in a large scale. The American law authorized the Treasury Department to loan money to the Allied Governments only for the war and during the war. If then we had wished to have credits for construction, it was necessary to have another law passed.

6. To take the necessary steps to have this new law passed was what I was about to ask Mr. McAdoo, Secretary of the Treasury. After negotiating with Mr. McAdoo for five days we arrived at an agreement, and he informed me that he would present the matter to Congress. I returned to France having obtained his promise in connection with this matter. Upon my return, the Communists' press attributed my voyage to the most extravagant motives.

7. The law as contemplated would have permitted us to dispose of several billions in credits. Of course it must be understood that under the same conditions that dollars were loaned for the war, that the dollars loaned for construction would have to be spent in the purchase of material in the United States or in the employment of American workmen. In any event we would have had the benefit of the powerful American industrial organization to help us rebuild our ruins and we would not have had to make any immediate payment.

8. When I returned to France, I immediately met with all sorts of resistance. I begged M. Loucheu and Clementel, minister of the reconstruction of the industries, to draw up a program—that is to say, a list of material to be purchased in the United States and the number of American workmen needed to complete the work. I was not able, notwithstanding my insistence, to receive any reply.

9. My two colleagues spoke of the necessity of assuring work to the French factories and by every means to avoid unemployment. From November, 1918, until May, 1919, this situation did not change. Several

American and English industries came to Paris, due entirely to the proposed law which McAdoo had under consideration, with the view of aiding us to rebuild the devasted country, and naturally to make a certain profit on the deal. It resulted that during the month of May, the American Treasury, seeing that the demand for credits was no longer desired, did not present the proposed law for passage. The party of protective reconstruction triumphed. We missed the chance to have foreign capital become interested in the rebuilding of France. I believe that this was an error; as sufficient proof we have only to recall that M. Loucheur, the champion of protection in 1919 was in 1921 the negotiator of the accords with Wiesbaden, against which we have heard the objections of the French firms.

10. And above all, this helped to weaken the business ties between the United States and France. I say it without irony, but as the result of experience. If we desire to arrange sentiment we must also find a means of satisfying business interests. All of this time the American production would have been associated with our efforts and the American people would have many times brought pressure to bear with their Government in our favor.

11. Nothing is more useless than the regrets of what might have been. The above is simply to clarify the present difficulties. The greatest danger in the present financial situation is the strong partition which separates the French interests from the interests of the Anglo-Saxons.

12. I will be greatly mistaken if M. Parmentier, upon his return from the United States, does not confirm this sentiment.

FRANCE-BRITISH CO-OPERATION.—The question of eventual naval co-operation has been examined in the most friendly spirit by Admirals Beatty and Grasset, and, should circumstances require it, events would show that the squabbles of politicians have not weakened the hearty sentiment of comradeship which fifty months of close fraternity of arms in the face of a common danger have so firmly established between Jack and Mathurin. In the course of their exchange of views the two Allied Admiralties promptly recognized that future co-operation has been rendered easy by what the two navies have achieved together. They could anew become parts of the same supreme naval force. It is no longer a secret that, although President Poincaré unreservedly worked in favour of conciliation in the Turkish question, he has ordered at the same time effective preparations with a view to standing by England should the latter be threatened in her vital interests.—*Navy and Military Record*, 4 October, 1922.

DELAY IN RATIFICATION.—Paris, October 11.—Although a certain parliamentary group in France today is urging ratification of the Washington naval reduction, it is declared that even in case ratification was decided upon it would not come in time to be of help to the Republican party in the November elections.

The Naval accord, which is still going the rounds of various naval commissions, is scheduled for a vote in the sessions of the Chamber which commences Thursday, but uncertain events in the Near East, the spector of Russia and the loss of the battleship *France* are causing doubtful predictions as to early ratification. Furthermore, the fact that other European signatory Powers have not ratified the pact does not hasten action by France.

The official view of France is that she must ratify the accord, especially in view of her recent protestations before the League of Nations on the subject of disarmament, and because France wants something tangible to support Premier Poincare's "peace policy" in the Near East imbroglio.

Many difficulties still stand in the way, principally an extra heavy program for the coming sessions.—*Boston Evening Transcript*, 11 October, 1922.

EFFICIENCY OF SUBMARINE FORCE.—Although not more than 2,400 seamen are affected to the underwater branch, the French submarine force has given lately unmistakable proofs of efficiency. Either singly or by pairs our submersibles undergo, as a matter of routine, endurance tests of long duration that are directly and indirectly benefiting personnel and matériel, and it is *la mode nouvelle* for specialists of the constructional branch to take a part in those prolonged trials of new or modified craft. Whereas before the war submarine commanders were officially deprived of initiative, and jealously kept in the shadow of the flagship with a view to playing a rôle in fleet action, they are now trained to act independently and to seize opportunities for bold enterprise. The pre-war French submarine force proved something of a disappointment, but past mistakes have been corrected, and a new spirit animates the flotillas, in which cheerful confidence prevails.—J. B. GAUTREAU, *Naval and Military Record*, 27 September, 1922.

COMMERCIAL ADVERTISEMENT BY NAVY.—An experiment is being made in France in the way of utilizing the navy for commercial propaganda work. The two battleship cruisers *Jules-Michelet* and *Victor-Hugo* will start shortly on a nine months' cruise to Madagascar, Australia, New Zealand, Japan, China and India, and will carry catalogues, prospectuses, documents and literature of all kinds, provided by traders and manufacturers for distribution to those whom they may interest in the ports visited. There will be persons in attendance to give information upon the goods that France is able to export. The cinematograph will be employed to show the manufacturing and industrial resources of the country.—*The Engineer*, 29 September, 1922.

FRANCE AND NAVAL DISARMAMENT.—Admiral Favereau, the distinguished French officer who during the war held an important North Sea command, has been expressing himself rather frankly on the subject of naval disarmament. In common with many of his countrymen, he believes France will best serve her interests by refusing to ratify the naval treaties negotiated at Washington. He considers them to have been drawn up chiefly with an eye to the interests of Britain, America, and Japan, and thinks that the only fair method of naval limitation is to make relative strength as it existed in 1914, the basis of future tonnage ratios. If that were done, France would have a much larger allotment of capital ship tonnage than has been conceded to her. Not only would she take precedence over Japan, but instead of being placed on a level with Italy she would be twice as strong as that Power.

The admiral is also very severe on the submarine agreement, which he regards as contradictory, seeing that the first paragraph is virtually stultified by later ones. "It would appear," he says, "that the Washington Conference behind its seeming humanity marked a triumph of selfish interests. The French nation has therefore decided not to ratify those interests." It is hardly necessary to remind Admiral Favereau and others who think as he does that such action by France would bring about a serious situation, which might render the entire work of the Washington Conference null and void. Repudiation of the submarine agreement alone might not be such a grave step, except from the moral point of view, since that instrument might in any case break down under the stress of war; but failure to ratify the naval limitation compact would reopen the whole question of future relative strength, which, it was hoped, had been settled for at least a decade.—*Naval and Military Record*, 4 October, 1922

GREAT BRITAIN

NAVAL COMPETITION REVIVING.—Realizing the grave position in which the American Navy would be placed if a sudden emergency found it without a single high-speed cruising ship, the General Board is anxious to push forward the completion of the ten *Omahas* with all possible haste. As regards the new vessels whose construction is to be recommended, they will almost certainly be designed as a match for the 10,000-ton cruisers which Japan is about to lay down. This being the limit of displacement which the Naval Agreement permits, it will be interesting to observe how Americans and Japanese constructors tackle the problem of incorporating the best fighting qualities in a vessel of that size—always assuming that Congress can be prevailed upon to vote the money for new cruisers.

Idealists in America have unfortunately spread the delusion that naval rivalry was completely stopped by the Washington Conference, when, as a matter of fact, it was simply diverted into another channel. The process of disillusionment is likely to be painful, and may lead to much acrimonious comment at the expense of Japan. As it is, the threatened revival of shipbulding competition in the lighter types of warships is the logical sequel to the refusal of the Conference to accept Great Britain's proposal for abolishing the submarine, a refusal to which the United States was unquestionably a party. Had the submarine been vetoed there would have been no difficulty in applying the tonnage ratio to all types of fighting craft, instead of to capital ships only, in which case the world would not now be on the verge of a new phase of naval competition.

THE SUBMARINE FLEETS.—The American Navy's demand for additional submarines is rather surprising, in view of its generous supply of these craft. In October of last year it had 148 boats. Since that date twenty-two old boats have been placed on the disposal list, so that the total establishment is reduced to 126. This figure, however, still compares very favorably with the British total, which in the course of the present financial year is to be brought down to fifty-eight, as announced by the First Lord in his statement on the current Navy Estimates. Adding six boats now in Australian service and two in Canada—though the latter will probably be scrapped—the submarine establishment of the British Empire comprises only sixty-six boats all told, or little more than half the American total. The precise strength of Japan in these craft is uncertain, but she is known to have in hand a large program which, when completed, will place her second only to the United States in point of numbers.

The real strength of the Japanese submarine position is believed to lie in the large proportion of boats which are endowed with an extensive radius of action. On the other hand, most of the American submarines are short-range boats which could not be used for independent trans-Pacific operations. Probably, however, the published figures of submarine endurance are no more to be relied on as a true index of radius than were the fuel endurance figures of surface ships in the coal-burning era. In those days it was customary to deduct from forty to fifty per cent from the nominal maximum, owing to the heavy consumption of fuel for driving auxiliary machinery. The result was that cruisers with a paper range of 10,000 miles were unable in practice to steam more than half that distance without bunkering. Another factor that enters into the question of submarine range is the capacity of personnel to endure the strain of prolonged service in these boats, which are not distinguished for habitability. For the largest German submarine built during the war, a radius of 20,000 miles was claimed but it is very doubtful whether the crew could have remained fit and efficient after half that distance had been covered without putting into harbor.—*Naval and Military Record,* 20 September, 1922.

PROHIBITION ON THE HIGH SEAS.—It is perhaps as well that events of more immediate gravity in the Near East should have diverted attention in this country from the singular incidents which have been taking place across the Atlantic in connection with the suppression of "rum running." Up to the present more than a score of British vessels have been seized by ships of the U. S. "Prohibition Navy," most of them admittedly far beyond the three-mile limit to which American jurisdiction is legally restricted. In one or two cases this high-handed procedure has been resisted, the latest instance being that of the British yacht *Onward*, whose skipper refused to let the American revenue officer come on board and forcibly removed his hands from the rail. It is admitted at Washington that there is no statute in the international code which justifies this high-handed procedure on the part of the American revenue officials, and only its prompt discontinuance can absolve our Government from the unpleasant duty of making strong representations to Washington.

That the advocates of prohibition should feel annoyed at the spectacle of foreign ships bringing cargoes of forbidden liquor to the vicinity of their coast is easily understandable, but that is no reason why they should set at naught one of the cardinal rules of international law and molest British ships which, technically at least, are passing on their lawful occasions well outside American territorial waters. There seems not a shadow of doubt that the Prohibition patrols have been guilty of arbitrary and grossly illegal acts, incidentally violating the very principle which their own country fought to defend in 1812. Fortunately, there are signs that the Washington authorities intend to curb this intemperate zeal on the part of their subordinates. They have, in fact, forbidden the seizure of foreign ships outside the three-mile limit, and everyone will hope that this order will put an end to a course of conduct which, if persisted in, might react unfavorably on our excellent relations with the United States. A touch of irony is given to the situation by the remark of a New York paper that for every gallon of liquor seized in foreign ships a thousand gallons are illicitly manufactured in the State of New York alone.—*Naval and Military Record*, 4 October, 1922.

ENGLISH ORDERS PLACED WITH KRUPP.—*The Matin*, Paris, reports from London that the Krupp factory at Essen has just received a large order from a firm in Glasgow for material to be used in ship construction. It is stated that the prices of the German firm were very much lower than those of English firms.

STATUS OF BRITISH AIRCRAFT CARRIER.—On August 9, 1922, the Marquess of Graham published a letter in the *Morning Post* in regard to battleships and aircraft. The substance of this letter was that the British Navy's great need at present was for airplane carriers, and he suggested that the Admiralty should build at once at least three large aircraft carriers, of lower freeboard than the *Argus* and with greater speed and other improvements, with at least thirty airplanes attached to each carrier, and with the whole complement in personnel—whether for air or sea service—belonging to the navy proper. After the airplane carriers to the above extent had been provided for, he said that post bellum battleships should then be built to suit the purse.

In reply to this letter, the naval correspondent of the *Morning Post* of August 11, 1922, published the following statement:

In view of the letter from the Marquess of Graham, published in these columns on Wednesday, it seems desirable to set forward the position in which the Royal Navy stands to-day in regard to aircraft carriers built and building.

Aircraft carriers are the only type of vessels, besides capital ships, the total tonnage of which is limited by the Washington Naval Treaty; it being laid down that the total tonnage for aircraft carriers of each of the contracting powers shall not exceed: United States and British Empire, 135,000 tons each; Japan, 81,000 tons; France and Italy, 60,000 tons each. Replacement of existing tonnage is also provided for, but with the special proviso that all aircraft carrier tonnage in existence or building on November 12, 1921, shall be considered experimental, and may be replaced, within the total tonnage limit prescribed, without regard to its age.

A further clause fixes the maximum displacement of any one aircraft carrier at 27,000 tons; but the contracting powers are permitted to convert ships which otherwise would be scrapped under the provisions of the treaty with aircraft carriers up to a tonnage of 33,000 tons for each ship so converted, without increase of total tonnage allowed. The United States is converting two of the six battle cruisers which are now building under this arrangement, the remaining four being scrapped.

All the aircraft carriers belonging to the Royal Navy, built and building, fall under the experimental category. There are completed and now in service the *Argus, Pegasus,* and *Ark Royal*; of which the first alone can be regarded as in any sense constituting an ocean-going aircraft carrier, the other two being makeshifts. Two carriers, *Eagle* and *Hermes,* are on the point of completion, and should be passed into service during the current financial year. The former is a convert battleship, the *Almirante Cochrane,* taken over by the Admiralty when in course of construction for the Chilean Government by Armstrong's. She is of 22,790 tons displacement, and has a speed of 24 knots. *Hermes* is a smaller type of vessel, specially designed by Sir E. Tennyson d'Eyncourt, and has a displacement of 11,000 tons, with a speed of 25 knots. Finally there is the *Furious,* originally a 31-knot cruiser of 19,000 tons, converted into an aircraft carrier during the war, in which rôle she did good service with the Grand Fleet in 1917-18. This vessel is now undergoing reconstruction at Devonport, a sum of £300,000 having been voted for that purpose in the navy estimates, 1922-23. She will not, however, be completed until 1923-24.

Aircraft carriers for service with the fleet are yet in their infancy. Much experiment and experience under all conditions to be met with at sea is necessary before the ideal carrier can be designed; although at present the British Navy is far in advance of any other navy in this respect. It would seem, therefore, that the Admiralty policy of experimenting mainly with converted vessels is the correct and most economical course to follow, having regard to the lead possessed in this type of vessel and the "experimental clause" of the naval treaty referred to above. To sink several millions prematurely in building new vessels which, when completed, would very probably not embody the features which progressive experiments would demonstrate were necessary, would handicap the Royal Navy during the whole period that the naval treaty remains in operation.

ROYAL NAVY POSTGRADUATE COURSE FOR OFFICERS.—At the present time the following courses are being conducted with the number of student officers noted:

1. *Specialist Courses.* These are for officers specializing in particular duties, viz.; Gunnery, Signals and Wireless Telegraphy, Navigation, and Engineering. The number of officers attending these courses is governed by the requirements each year. The length of the courses and the number for the present year are as follows:

Course	*Number*	*Remarks*
Gunnery	10	9 months preliminary course at R. N. College Greenwich followed by 9 months in Gunnery or Torpedo School.
Torpedo	8	
Signals and W/T	6	9 months course at Signal School, Portsmouth
Navigation	10	7 weeks course at the Navigation School, Portsmouth
Engineering	32	Two terms (about 6 months) at R. N. College, Greenwich followed by a course of about 18 months at R. N. Engineering College at Keyham.

II. Courses for Junior Executive Officers to qualify for the rank of Lieutenant.

	Length of course
Educational Course at R. N. College, Greenwich	6 months

	Length of course
Gunnery Course at Gunnery School, Portsmouth	12 weeks
Torpedo Course at Torpedo School, Portsmouth	6 weeks
Navigation Course at Navigation School, Portsmouth	6 weeks

All Executive Officers are required to take these courses soon after promotion to the rank of Acting Sub-Lieutenant.

LOSS OF BRITISH WAR VESSELS.—The destroyer *Speedy*, 1,087 tons, built by Thornycrofts and commissioned August, 1918, was lost in the Sea of Marmora on September 24, after a collision.

The British Admiralty has decided not to attempt to salvage H. M. S. *Raleigh* except for equipment readily removable.

BRITISH FLEET IN NEAR EAST.—Practically the entire Mediterranean Fleet has been concentrated in the area: Dardanelles, Sea of Marmora and Bosporus.

The following Naval units have been detached from the British Atlantic Fleet and ordered as reinforcements to the British Mediterranean Fleet:

First Battle Squadron

First Division	Second Division
Barham (Flag of V. A. C.)	*Revenge* (Flag of R. A.)
Madaya	*Ramillies*
Valiant	*Resolution*
Warspite	*Royal Oak*

Second Light Cruiser Squadron

Curacoa (flag)
Caledos
Carysfort
Castor
Cordelia
Cambrian has been ordered to join this squadron

Curacoa, Carysfort and *Cordelia* of this squadron are known to be in Turkish waters. The exact whereabouts of the *Caledon* and *Castor* are not known at the present time.

Second Destroyer Flotilla

Spencer (Flotilla leader)
Vanquisher
Vectis
Venetia
Viceroy
Violent
Viscount
Winchelsea
Wolfhound

Third Destroyer Flotilla

Campbell (Flotilla Leader)
Verity
Veteran
Wanderer
Wild Swan
Wishart
Witherington
Wivern
Wolverine
Aircraft Carrier *Ark Royal*
Aircraft Carrier *Argus*

Second Submarine Flotilla

Lucia (Depot ship)
Adamant
L.18
L.21
L.22
L.25
L.52
L.56
L.71

First Destroyer Flotilla

Wallace (Flotilla Leader)
Vancouver
Velox
Versatile
Vortigern
Walker
Warwick
Watchman
Whirlwind

The destroyers *Rigorous* and *Romola,* which were in reserve at Gibralter, have received full complements and have proceeded to Turkish waters.

The complements of the battleships *Centurion* and *Ajax* have been raised to full complements, and these vessels have proceeded to Turkish waters.

The light-cruiser *Ceres,* of the Mediterranean Fleet, has been recommissioned and has proceeded to Turkish waters.

The light-cruiser *Vindictive* has just arrived at Malta upon her third trooping trip. This vessel also carries certain aircraft.

The flagship of the British Atlantic Fleet, the *Queen Elizabeth,* is in the Firth of Forth.

The First Light Cruiser Squadron and the Fourth Destroyer Flotilla are just completing a special cruise in the Baltic and, as these are the only other light forces with full complements available, it is probable that they will be despatched to the Near East should the situation there become more serious. The cruise of these forces is in the nature of a diplomatic cruise, and it was therefore desirable to complete it if possible.

In accordance with the procedure in emergencies, the Admiralty has suspended publication of the movements of British vessels of war in the Mediterranean.

JAPAN

JAPAN'S NAVAL CONSTRUCTION PROGRAM.—Since we last wrote on the subject of Japanese naval policy there have been important developments which merit some further comment. In an article published on May 26, we renewed the principal modifications in the shipbuilding program

brought about by the Washington Treaty, and showed that economic necessity was compelling Japan to proceed with the construction of a fairly large number of so-called "auxiliary combatant craft," the aggregate tonnage of which is not restricted by the Treaty. The Imperial Navy Department in Tokyo has now issued a statement explanatory of its shipbuilding plans for the near future. According to this document, there is no truth in the reports circulated abroad, principally in the United States, that a large increase in the number of auxiliary vessels which had been authorized previous to the Conference is meditated. On the contrary, it is stated, the total is actually to be reduced by one cruiser, thirteen destroyers and twenty-four submarines, as compared with the original program of ships to be completed by the year 1927. At the same time, however, the designs of all remaining vessels have been re-drafted on the basis of greater dimensions and power, so that the deletion of the thirty-eight units enumerated signifies a reduction of only 13,935 tons in the total displacement of the pre-Conference program. It is clear from this that very large additions have been made to the displacement of the surviving vessels, which comprise the following: Four cruisers of 10,000 tons each; four cruisers of 7,000 tons each; twenty-four destroyers of the first class, with an aggregate of 33,000 tons; and twenty-four submarines, with a collective displacement of 28,166 tons. It is not stated which of these vessels, if any, have already been laid down, but in any case they are likely to be put in hand as soon as circumstances permit, since they are intended to provide the leading shipyards with employment in place of that which was lost through the cancelling of the capital ships. The four largest cruisers, it is surmised, will be distributed among the leading State and privately owned yards—Kure and Yokosuka in the former category and Kawasaki and Mitsubishi in the latter. One of the 7,000-ton ships may be built at Sasebo Arsenal and the other three by contract.*

Four of the new cruisers, it will be observed, are to be of the maximum displacement which the Washington Treaty specifies for ships of this type. They will therefore be the largest modern cruising ships to be found in any navy up to the present, surpassing our *Raleigh* class by 250 tons, and showing an excess of no less than 4,400 tons over the largest hitherto built in Japan. As they are expected to embody very high speed, a large fuel capacity, special features of protection, and a main armament of the heaviest caliber permitted by the Treaty, viz., 8-in. guns, particulars of their design will be awaited with more than ordinary interest. As regards the 7,000-ton cruisers, at least one vessel of this displacement is known to have been laid down recently, and it is probable, though not certain, that this ship is included in the quartet embraced by the modified program. As will appear later, Japanese constructors have been singularly successful with their recent light cruiser designs, which compare very favorably with the best cruising ships now under foreign flags. A total of 33,000 tons for the twenty-four new destroyers gives an average of approximately 1,375 tons per boat, as compared with the 1,345 tons of the latest first-class Japanese destroyers to be completed. The lower figure corresponds more or less to the displacement of our *Admiralty V.* class, which have machinery of 27,000 shaft horsepower for a speed of 34 knots. The Japanese 1,345-ton boats, however, are credited with 38,500 shaft horsepower, or only 1,500 units less than our *Admiralty* type flotilla leaders, which displace 1,800 tons. Evidently, therefore, the new Japanese destroyers are capable of developing very high speeds. The first-class boats are now armed with four 4.7-in. guns, two anti-aircraft machine-guns, and

*Since the above was written a despatch from Tokyo, dated August 19, states that the construction of two 7,500-ton cruisers will be begun shortly. They are to be named respectively *Kinugasa* and *Furutori.*

six torpedo tubes, but in the latest design a fifth 4.7-in. gun is said to be provided for.

Turning to the submarines of the amended program, the average displacement of the twenty-four new boats works out at 1,173 tons, but it is not expected that the entire group will be of uniform design. As far back as 1920, Japanese plans were got out for several types of large cruising submersibles, ranging in surface displacement from 1,500 to 2,500 tons, with a maximum speed of 18 knots, and in the course of last year the first 1,500-ton boats were laid down. Their displacement is almost double that of the earlier boats, which are 740 tons in surface trim and 1,100 submerged. Problems of submarine design receive the most careful attention in Japan, where a continuous effort is made to assimilate the best features of foreign, including German, construction into the basic design which has been evolved to meet special Japanese requirements. So far as can be ascertained, the manufacture of large-powered Diesel engines for submarine propulsion is still imposing a severe strain on the national industry, and it has been found necessary to enlist the aid of both British and continental firms to meet the demand for such machinery. Details of these orders are not yet available, but it is understood that the first boats of the new 1,500-ton type will be equipped with Diesel engines of European manufacture. In all other respects, however, the modern Japanese submarine is of purely national conception. It differs from the prevailing foreign types by reason of its large reserve of buoyancy, which is nearly fifty per cent. This is in accordance with German practice, while contemporary boats of British, American, and French designs have a much smaller reserve of buoyancy. The inner hull of the Japanese boat is small, but it is enclosed in a very large outer hull, with the result that the interskin spaces are exceptionally large. By this system the water ballast tanks and the oil storage spaces are considerably enlarged, the margin of safety is increased and the cruising endurance prolonged. In the opinion of Japanese naval officers, their submarines, though perhaps rather less speedy than foreign boats of similar tonnage, are better adapted to general war service, especially in the waters of the Pacific Ocean.

The exact number of submarines completed, built and projected for the Japanese Navy cannot be stated with certainty, information on this point being vague and contradictory. Taking sixty as the number of the last boat authorized before the modified program was adopted, and adding the twenty-four new boats specified in that measure, we obtain a gross total of eighty-four submarines. This, however, includes thirteen early boats which are too small to be effective outside coastal waters, and should therefore be omitted from any estimate of strength in ocean-going craft. The total is thus reduced to seventy-one boats, as compared with the fifty-eight boats of which the British submarine flotilla will consist when the deletions ordered by the Admiralty during the current financial year have been made. The American total is very much larger, but will be found on analysis to include a great number of boats of small tonnage and restricted endurance. Of large ocean-going submarines, comparable with those now built or being built for Japan, the United States has only fifty-six completed or building. It will thus be seen that Japan is in a far stronger and better position with regard to submarine strength than a cursory glance at the comparative tables would suggest.

Special interest attaches to the battleship *Mutsu*, which formed the subject of so much discussion at the Washington Conference. It will be recalled that under the original American scheme of limitation, this vessel was to be scrapped, a proposal to which the Japanese delegates took strong exception, mainly on the ground that she was practically completed before

the Conference met. After weeks of debate, it was finally agreed that the *Mutsu* should be retained, corresponding adjustments being made in the ratios of capital ship tonnage allotted to Japan, the United States and the British Empire respectively. As a result of this compromise, Great Britain was empowered to lay down two new 35,000-ton battleships. It will therefore be seen that Japan's successful claim to keep the *Mutsu* had far-reaching effects. Until our new vessels are afloat, this ship and her sister, the *Nagato,* will continue to represent the heaviest type of battleship in the world, though their individual displacement is 7,400 tons less than that of the British battle cruiser *Hood.* Laid down at Yokosuka Dockyard on June 1, 1918, the *Mutsu* was launched on May 31, 1920, and went into commission during December, 1921. Her leading characteristics are: Length between perpendiculars, 660ft. 7in.; length over all, 698ft. 6in.; breadth, 95ft.; mean draught of water, 30ft.; displacement, 33,800 tons. The lines of the hull, moulded with an eye to speed, are somewhat finer than those of the latest foreign battleships. There is no external bulge, but an elaborate system of subdivision in association with armored bulkheads placed well back from the outer plating is believed by her designers to make the ship reasonably invulnerable to under-water attack. The motive power is supplied by geared turbines of 46,000 shaft horsepower. There is no definite information as to the number or type of the boilers. The speed of the *Mutsu* on the measured mile is returned as 23.4 knots, but the ship is said to have attained higher speeds than this in her full-power endurance trials.

As it is not the custom of the Japanese authorities to disclose details of armor protection in their modern ships, the thickness of the *Mutsu's* side, deck and turret armor can only be surmised, but according to the percentage of other weights to total displacement, it would appear to be very massive. The main armament consists of eight 16-in. 45-caliber guns, mounted in four turrets on the center line of the ships. These weapons were constructed at the Muroran Ironworks, and the breech mechanism at Kure Arsenal. Each gun weighs 112 tons unmounted, and throws a projectile of about 2,200 lbs. The mountings permit an elevation up to twenty-five degrees or thirty degrees. Twenty 5.5-in. quick-firing guns are disposed in casemates, the position of the secondary armament being clearly visible in the illustration. There are besides four 12-pounder anti-aircraft guns, four above-water torpedo tubes, and four submerged tubes. As in the *Nagato*, the foremast is a gigantic heptapod structure, supporting searchlight platforms, control tops, and director towers for the main and secondary armament. Great rigidity is claimed for this form of mast, as well as immunity from destruction by shell fire; but the weight involved must be serious, and the large area of target it offers is a further drawback. The opening visible at the stern of the ship leads out of the admiral's quarters, and presumably takes the place of the overhanging stern-walk fitted in some earlier ships, which was liable to be flooded in heavy weather or when the ship was steaming at full speed. With the commissioning of the *Mutsu,* Japanese capital ship construction is to be suspended for a term of ten years, conformably with the Limitation Treaty. The 40,100-ton battleships *Kaga* and *Tosa* launched last year are to be used as target ships and eventually broken up; while the battle cruisers *Amagi* and *Akagi,* still on the stocks, have been re-designed as aircraft carriers, each displacing 26,000 tons.

The light cruiser *Oh-i* is one of a very numerous class of ships which have proved an unqualified success. Her sister vessels are the *Kuma, Tama, Kitakami, Kiso, Nagara,* and with slight modifications, the *Natori, Isudzu, Yura, Kinu, Ayase, Otonase, Minase, Abukuma.* The *Oh-i* herself was begun at the Kawasaki Yard, Kobe, in November, 1919, launched the

following July, and completed last autumn. The first ships of the class were begun in 1918, and the last unit, *Abukuma*, is still on the stocks. The principal dimensisons of *Oh-i* are as follows: Length between perpendiculars, 500ft.; length over all, 535ft.; breadth, 46ft. 9in.; mean draught of water, 15ft. 9in.; normal displacement, 5,500 tons. She has geared turbines of Parsons type, taking steam from fourteen boilers, mainly oil-fired, and developing 90,000 shaft horsepower. We understand that the designed speed of 33 knots has been exceeded by every ship of this class which has hitherto made her trials, and that in at least one case the remarkable velocity of 34 knots was achieved. This is easily a world's record for light cruiser speed, and one that reflects the utmost credit on Japanese engineers and engineering. Our own light cruisers of the *E* class, of 7,600 tons, are expected to develop 80,000 shaft horsepower, equivalent to 33 knots when in light condition, and the American *Omahas*, of 7,500 tons, are designed for 90,000 shaft horsepower and 33.7 knots; but meanwhile the Japanese ships have actually exceeded both these velocities. The *Oh-i* and others of her type are protected by a partial belt of high-tensile steel, reinforced by an armo deck, 2½in. thick at the extremities. They are armed with seven 5.5in. quick-firing guns, throwing an 82 lb. shell. Two of these pieces are placed tandem-wise on the forecastle, one is on each beam abreast the foremast, and the remaining three are on the center line in the after part of the ship. While this disposition limits the direct-ahead fire to three guns and the stern fire to one gun, on the other hand, it permits of a powerful concentration of fire on the bow or quarter, and the fact that it has been adhered to in so many ships is evidence of its tactical advantages. There are eight 21in. deck torpedo tubes mounted in pairs, two on each side at the break of the forecastle, and two in similar positions abaft the aftermost funnel. Two 12-pounder guns are carried for aircraft attack. As will be seen from the illustration, all the guns have an excellent command, thanks to the high freeboard of the ship and the mounting of the after weapons on the superstructure deck.

These light cruisers are reported to be splendid seaboats, and able to work their armament with effect in conditions of weather which would severely handicap low-lying craft, such as our *C* and *D* vessels. A squadron consisting of the *Oh-i, Kiso, Kitakami,* and *Tama,* escorted the Prince of Wales in H.M.S. *Renown* from Hong Kong to Yokohama, and their admirable behavior in the heavy weather which was encountered during the passage was observed with great interest from the British ship. According to the Admiralty *Return,* mentioned above, Japan now has twenty-five effective light cruisers built and building, all but four of which date from 1918. If, therefore, the eight ships of the post-Conference program are all additional to these, the establishment will eventually reach thirty-three ships or, deducting the four older vessels, twenty-nine light cruisers, the slowest of which has a trial speed of 33 knots. Unless present programs are considerably amplified, no other navy will be able to match this remarkable fleet of cruising ships.

Steady progress continues to be made in the development of the destroyer flotillas. At the beginning of the year the effective boats in service numbered fifty-nine, the majority of which are of post-war design; and twenty-eight were under construction. As a number of additional boats have been commenced during the year, the present position is approximately as follows: Built, sixty-five; being built, thirty. To these must be added the twenty-four destroyers to be laid down in accordance with the amended program, the completion of which will bring the establishment up to fifty-five first-class boats and fifty-six second-class, the former with displacements ranging from 1,085 to 1,400 tons, and the latter from 600 to 850 tons. As in all other types of warships recently designed in Japan,

the new destroyers exhibit a high degree of tactical efficiency in proportion to their size. The latest design of which we have cognizance is that of the *Shiokaze* class, launched in 1920, and to which belongs the *Hakaze*. The chief dimensions of this class are: Length between perpendiculars, 320ft.; length over all, 336½ft.; breadth, 29¼ft.; mean draught of water, 9½ft. Machinery: General turbines drawing steam from four oil-fired boilers, and developing 38,500 shaft horsepower for a speed of 34 knots. The armament comprises four 4.7-in. 45-pounder quick-firing guns, two anti-aircraft "pom-poms," and six 21-in. torpedo tubes mounted in pairs. In the later boats, it is anticipated, the extra displacement will be utilized to increase the fuel capacity, and the gun armament may be strengthened. The *Ashi* was launched in September, 1921, and commissioned about four months ago. She is 275½ft. long between perpendiculars, 26ft. broad and draws 8ft. of water at the normal displacement of 850 tons. Her machinery consists of turbines, apparently without gearing, and three oil-fired boilers. On trial, the *Ashi* developed considerably more than the 21,000 shaft horsepower stipulated in the contract, and bettered her designed speed of 31.5 knots by nearly 2 knots. She carries three 4.7-in. guns, two anti-aircraft machine guns, and four 21-in. torpedo tubes. It is evidently the intention to discontinue the building of second-class boats in future, as the whole of the destroyers to be laid down under the new program are of the first-class type.

Submarine *No. 23* is a "medium ocean-going" boat, completed late in 1920. Her displacement in surface trim is 740 tons, increased to 1,100 tons when submerged. The Diesel engines for surface propulsion develop 2,600 brake horsepower, and the electric motors for submerged running work up to 1,200 horsepower. The highest surface speed is not over 16 knots. Sufficient oil is carried for a radius of 6,500 sea miles. Two torpedo tubes are fitted in the bows and two in the stern. A short 12-pounder anti-aircraft gun is mounted abaft the conning tower. *The Engineer,* 6 October, 1922.

JAPAN BEGINS CUT IN YARD FORCE.—Washington, October 11.—Discharge of 6,000 Japanese navy yard workers, as beginning of the naval reduction program agreed upon at the Washington Arms Conference, was announced today in official advices to the Japanese Embassy. The step, taken in advance of an exchange of ratifications of the naval limitation treaty, was regarded here as reflecting the confidence of Japanese statesmen in the eventual acceptance of the pact by all the signatories.—*Baltimore Sun,* 12 October, 1922.

UNITED STATES

VESSELS UNDER CONSTRUCTION UNITED STATES NAVY—Progress as of September 30, 1922

Type Number and Name	Contractor	Per Cent of Completion October 1, 1922 Total	October 1, 1922 On Ship	September 1, 1922 Total	September 1, 1922 On Ship	Contract date of Completion	Probable date of Completion
BATTLESHIPS (BB)							
45 *Colorado*	New York S.B. Cpn	93.9	93.8	93.5	93.3	....	7/ 1/23
47 *Washington*	New York S.B. Cpn	....	....	....	....	....	Suspended
48 *West Virginia*	Newport News S.B. & D. D. Co	85.2	84.1	84.4	83.3	....	9/ 1/23
49 *South Dakota*	New York Navy Yard	....	....	....	....	....	Suspended
50 *Indiana*	New York Navy Yd	....	....	....	....	....	Suspended
51 *Montana*	Mare Island Nvy. Yd	....	....	....	....	....	Suspended
52 *North Carolina*	Norfolk Navy Yard	....	....	....	....	....	Suspended
53 *Iowa*	Newport News S.B. & D. D. Co	....	....	....	....	7/12/23	Suspended
54 *Massachusetts*	Beth. S.B. Cpn. (Fore River)	....	....	....	....	7/12/23	Suspended
BATTLE CRUISERS (CC)							
1 *Lexington*	Beth. S.B. Cpn. (Fore River)	33.8	24.2	33.8	24.2	....	Indefinite
2 *Constellation*	Newport News S.B. & D. D. Co	....	....	....	....	....	Suspended
3 *Saratoga*	New York S.B. Cpn	35.4	28.	35.4	28.	....	Indefinite
4 *Ranger*	Newport News S.B. & D. D. Co	....	....	....	....	....	Suspende
5 *Constitution*	Philadelphia Nvy. Yd	....	....	....	....	....	Suspende
6 *United States*	Philadelphia Nvy. Yd	....	....	....	....	....	Suspende
SCOUT CRUISERS (LIGHT CRUISERS) (CL)							
4 *Omaha*	Todd D.D. & Const. Cpn.	99.2	96.6	99.2	95.9	8/ 1/21	1/ 2/23
5 *Milwaukee*	ditto	96.3	93.3	95.9	92.9	12/1/21	3/ 1/23
6 *Cincinnati*	ditto	88.2	84.9	88.2	84.5	7/ 1/22	7/ 1/23
7 *Raleigh*	Beth. S.B. Cpn. (Fore River)	75.7	61.9	73.3	59.1	8/ 1/21	Indefinite
8 *Detroit*	ditto	93.8	87.6	92.1	85.4	11/1/21	2/15/23
9 *Richmond*	Wm. Cramp & Sons Co.	95.7	92.	95.	90.5	....	2/15/23
10 *Concord*	ditto	89.5	83.5	88.5	82.	....	5/ 1/23
11 *Trenton*	ditto	63.	52.	61.	49.	10/1/21	Indefinite
12 *Marblehead*	ditto	49.5	36.	48.	34.5	1/ 1/22	Indefinite
13 *Memphis*	ditto	42.	28.	41.	27.	4/ 1/22	Indefinite
AUXILIARIES							
Repair Ship No. 1, *Medusa* (AR1)	Puget Sd. Nvy. Yd	86.7	78.8	85.8	76.9	....	Indefinite
Dest. Tender No. 3 *Dobbin* (AD3)	Phila. Nvy. Yd	74.5	74.3	74.	73.8	....	Indefinite
Dest. Tender No. 4 *Whitney* (AD4)	Boston Nvy. Yd	63.2	54.5	62.3	53.6	....	Indefinite
Sub. Tender No. 3 *Holland* (AS3)	Puget Sd. Nvy. Yd	21.5	5.5	21.5	5.5	....	Indefinite
PATROL VESSELS							
Gunboat No. 22, *Tulsa* (PG22)	Charleston Nvy. Yd	78.5	69.3	77.2	67.4	....	Indefinite

Destroyers authorized but not under construction or contract.
(12) Nos. 348 to 359 inclusive.

Type Number and Name	Contractor	Per Cent of Completion October 1, 1922 Total	October 1, 1922 On Ship	September 1, 1922 Total	September 1, 1922 On Ship	Contract date of Completion	Probable date of Completion
			SUBMARINES				
115 *S-10*......	Portsmouth N.H. Nvy. Yd. Comm. 9/21/22....	....	....	97.6	97.4	....	....
116 *S-11*......	ditto..........	95.6	95.2	95.	94.4	....	Indefinite
117 *S-12*......	ditto..........	95.3	94.9	94.7	94.3	....	Indefinite
118 *S-13*......	ditto	93.8	91.8	93.2	91.4	....	Indefinite
123 *S-18*......	Elec. Boat Co. (Quincy)..	98.6	98.6	98.6	98.6	7/ 1/22	....
124 *S-19*......	ditto	98.4	98.4	98.4	98.4	9/30/22	....
125 *S-20*......	ditto	98.8	98.8	98.7	98.7	10/30/22	....
126 *S-21*......	ditto	98.2	98.2	98.1	98.1	10/30/22	....
127 *S-22*......	ditto	98 6	98.6	98.6	98.6	10/30/22	....
128 *S-23*......	ditto	98 5	98.5	98.5	98.5	11/30/22	....
129 *S-24*......	ditto	97 9	97.9	97.9	97.9	11/30/22	....
130 *S-25*......	ditto	98.	98.	98.	98.	11/30/22	....
131 *S-26*......	ditto	97.5	97.5	96.5	96.5	12/30/22	....
132 *S-27*......	ditto	94.	94.	93.	92.7	12/30/22	....
133 *S-28*......	ditto	96.8	96.8	93.6	93.4	12/30/22	....
134 *S-29*......	ditto	93.1	92.9	92.4	92.	1/30/23	....
X135 *S-30*......	Elec. Boat Co. (San Fran)	....	....	....	....	1/30/23	....
X136 *S-31*......	ditto	....	....	....	....	1/30/23	....
X137 *S-32*......	ditto	....	....	....	....	2/28/23	....
Z138 *S-33*......	ditto	....	....	....	....	2/28/23	....
Z139 *S-34*......	ditto	....	....	....	....	2/28/23	....
Z140 *S-35*......	ditto	....	....	99.5	99.5	3/30/23	....
141 *S-36*......	ditto	95.8	95.2	95.1	94.4	9/20/22	12/15/22
142 *S-37*......	ditto	94.2	93.4	94.	93.1	10/10/22	2/ 1/23
143 *S-38*......	ditto	91.	89.4	90.5	88.8	10/30/22	1/15/23
144 *S-39*......	ditto	87.7	85.3	87.6	85.2	11/19/22	3/ 1/23
145 *S-40*......	ditto	85.4	82.5	85.3	82.4	12/ 9/22	4/ 2/23
146 *S-41*......	ditto	87.6	85.2	87.5	85.1	12/29/22	5/ 1/23
153 *S-42*......	Elec. Boat Co. (Quincy)..	89.9	80.6	89.1	79.4	5/15/23	....
154 *S-43*......	ditto	90.8	82.3	90.1	81.2	6/15/23	....
155 *S-44*......	ditto	88.	77.7	87.6	77.3	6/15/23	....
156 *S-45*......	ditto	88.8	78.8	88.4	78.4	7/15/23	....
157 *S-46*......	ditto	87.3	76.7	86.9	76.3	7/15/23	....
158 *S-47*......	ditto	86.9	76.1	86.5	75.7	8/15/23	....
159 *S-48*......	Lake T.B. Co. (Bridgeport).................	99.5	99.5	99.	99.	7/ 1/21	10/23/22
			FLEET SUBMARINES				
163 *V-1* (*SF4*).	Portsmouth N.H. Nvy Yd....................	30.3	29.4	28.9	27.9	....	10 /24
164 *V-2* (*SF5*).	ditto	27.4	....	26.8	....	....	....
165 *V-3* (*SF6*).	ditto	27.4	....	26.8	....	....	....

Note: Submarines authorized but not under construction or contract: Fleet Submarines (6) Nos. 166-171. Neff Submarine (1) No. 108.

Z Hull complete. Engineering work only.

X Hull complete. Engineering work being completed at Groton, Conn.

OUR NAVAL SITUATION.—Our Naval situation may be discussed at length or in brief under the following four general heads:

I. Accomplishments of the Conference on Limitation of Armaments

The United States made by far the greatest sacrifice in order to establish the principle of Limitation of Armaments by International Agreement. The United States scrapped battleships on which it had already spent one-third of a billion dollars and which, when completed, would have given us undisputed naval supremacy. We recommended limitation in all classes of fighting craft, but agreement could only be reached on capital ships and air-plane carriers.

We agreed not to establish naval bases in the Western Pacific, thereby reducing our potential power in that locality to a negligible amount.

Competition has not ceased in the increase of matériel, its design, or in the sufficiency of efficiency of personnel. Whether or not it will be possible to extend the principle of Limitation of Armaments by Inter-

national Agreement to include all fighting craft, the future alone can tell. Probably the best article on the accomplishments of the Conference is embodied in the address of Rear Admiral H. S. Knapp, delivered on April 27, 1922, before the American Society of International Law and published in their proceedings for that year.

The Navy Department approves in full of any reasonable plan to limit armaments by international agreement, as relative strength within limits is a vital factor. It should not be overlooked, however, that sea-power is measured by three factors: (1) Navy or combat strength, (2) Naval and Commercial Bases, and (3) Merchant Marine; and to these might well be added Radio and Cable Communications.

In connection with this subject: the recent book written by Captain Knox might be read for more complete information. This book is entitled *The Eclipse of American Sea Power,* and is published by the *Army and Navy Journal.*

II. The Need of the Navy

An adequate navy is necessary in order that we may exert our influence effectively for the general good; secure and maintain our national policies; protect our own interests; insure our future prosperity and maintain our security as a nation. Our foreign policy is as strong as our navy and no stronger. A nation with little physical power has small weight in the council of nations and is given little consideration, even in regard to her own rights, and can certainly exert no influence for the rights of others.

Under this general head might be included the value of our navy in its aid to industry and commerce. At the present time a pamphlet is being prepared in the Navy Department with data obtained from all Bureaus regarding this subject.

The part the navy has played in all great wars has largely been overlooked. It can be given as an almost invariable rule that ultimate success in war lies with the power that controls the sea, having the resources of the world at its disposal and strangling its opponents by blockades.

Captain Overstreet has an excellent article in *The Outlook* of October 12, 1922, "Will Total Disarmament Prevent War?" In this connection it may be pointed out that if navies are reduced in size, the Merchant Marine is of increasing value for war purposes. With no regular fighting craft, the navies of the world would be their Merchant Marine.

This subject can be expanded indefinitely through a study of Mahan, Upton's *Military Policy of the United States,* and other books on similar lines. Upton's *Military Policy of the United States* does not deal very much with the navy, but does deal with questions of preparedness and "the cost of unpreparedness."

III. The Cost of the Navy

About eight per cent of the Federal revenue is spent on the navy. The Federal revenue is about one-third of the total taxes. Therefore about two and one-half per cent of the average total per capita taxes goes to the navy. The Federal taxes are not as evenly distributed as local taxes. Those who pay little or no income taxes are taxed little or nothing for the Federal Government, and consequently for the navy. The average per capita tax for the navy is three dollars. In the agricultural districts, where the navy is most opposed, the average per capita is about twenty-five cents.

The cost of the navy should not be confounded with the cost of past wars, which cost is in great part due to unpreparedness. Even leaving aside the risks we have run in the past and the unnecessary loss of life, from a financial standpoint only, the cost of unpreparedness has been far greater than the actual cost of wars, with adequate preparedness; and with

adequate preparedness, some of these wars could have been avoided and the others very much shortened.

The cost of the navy during peace is in great part repaid by its aid to industry and commerce.

The cost of the navy may be put on an insurance basis. Our exports are about six billion dollars a year, half of this being agricultural products. About two and one-quarter billion dollars a year are expended on private insurance policies. One-sixth of this amount if for National Insurance only would not be excessive.

There are those who maintain that the expenditures of the navy should be to a great extent given to schools; that the Federal Government spends very little on schools. In this connection it should be pointed out that education is not a function of the Federal Government, but is a function of local government; and that over one billion dollars in taxes are now spent by the people on schools. Whether or not this amount should be increased is subject to local decision. In the preamble of the Constitution are the words, "Provide for the common defense." This is a Federal function and its most important function.

IV. What Our Naval Policy Should Be

The discussion of this subject was in order before we ratified the Naval Treaty. It is hardly in order now even to discuss the subject. Our policy under the Treaty can be nothing other than to maintain a navy on a parity with Great Britain and five-thirds that of Japan in Regular personnel, Naval Reserves and fighting craft of every kind.

To maintain this policy we must maintain in full commission all battleships retained under the Treaty; we must build airplane carriers up to the Treaty limit; we must build cruisers to maintain our five in the 5-5-3 ratio, which means at the present time we should immediately have under construction twenty-two 10,000-ton cruisers; we must maintain our submarine strength, especially in fleet submarines of long radius. In this special type of submarines we are behind our ratio.

In destroyers we are ahead of our ratio, but have lost this advantage by having about two-thirds of them out of commission. It is an advantage to be ahead in any type, but destroyers cannot replace cruisers. We have no destroyer leaders.

To maintain this policy in personnel we require personnel equal to Great Britain and five-thirds times the number maintained in Japan.

It is difficult to make a direct comparison of personnel with Great Britain, for in their estimates they appropriate under fifteen different "votes." In "votes" one, appropriation is made for 88,805 men for the fleet; this does not include a large number of Reserves used constantly on fleet auxiliaries; the navy's quota of the Air Service; men on shore; men on service under Dominion and foreign governments; men in the Colonial Navy. We do not man our navy in part with reserves; we include our Air Force, recruits in training on shore, men at trade schools, recruiting stations, radio and compass stations, and other necessary military activities. On a conservative basis, to place our naval personnel on a substantial parity with that of the British Navy, we should appropriate for about 120,000 men.

Japan has a total enlisted personnel of 73,000 men. If we maintain our 5-3 ratio, we require five-thirds times 73,000, or about 122,000 men. We have a total of 86,000 men.

In time of war all navies are greatly expanded. We must make it an important part of our policy to organize and maintain a sufficient and efficient Naval Reserve.—*Department News Bulletin.*

NAVAL MISSION TO BRAZIL.—The U. S. Naval Mission to Brazil under Admiral Vogelgesang, is attracting international attention.

A correspondent of the London *Times* views the affair with alarm and delares that "it foreshadows the eclipse of the ancient British prestige and influence in the Brazilian navy." He goes on to say, "As the result of British pre-occupation during and since the war, the Americans have been left practically a free field in Brazilian naval affairs, of which they have not been slow to take advantage. The infiltration of American ideas among the younger Brazilian naval officers has been steady and progressive, and has been aided by the American aviation and staff instructors contracted during the latter part of the war, as well as by proper naval representation attached to the American Embassy. In contrast to this, British official interests have been confided to a naval attaché of junior rank, whose duties were not confined to Brazil, but extended to the Argentine and Uruguay, with headquarters in Buenos Aires, and whose visits to Rio de Janeiro have been infrequent and hasty."—*Our Navy*, 7 October, 1922.

CHILE

THE CHILEAN NAVY.—By decree of August 3, 1922, the following ships have been placed in ordinary: *O'Higgins, Captain Prat, Esmeralda, Blanco Encalada.*

This leaves in active commission, forming the active Fleet:

Dreadnaught	*Latorre*
Cruiser	*Chacabuco*
Destroyers	*Lynch*
	Condell
	Uribe
	Williams
	Riveros

The only other ships in commission are the:

Submersible	*H-1*	
Cruiser	*Ministro Zenteno*	—On Hydrographic work in Straits of Magellan
Transports	*Baquedano* *Angamos*	—On a practice cruise off the Chilean Coast

MERCHANT MARINE

USE OF OIL FUEL GROWING RAPIDLY.—The fitting of an increasing proportion of the world's tonnage to use oil continues unabated. The percentage of the total tonnage thus equipped has risen from 3.09 per cent in 1914, to 24.69 per cent at the present time. This change has been occasioned by two conditions.

These are the conversion of coal-burning vessels to an oil-burning basis and the construction of motor or Diesel driven vessels. The adoption of the internal combustion or Diesel type of propulsive equipment is just beginning to assume important proportions in the United States; but in Great Britain and the continent of Europe this phase of the development has been and is making rapid strides.

The motor-equipped ship has unquestionably a strong advantage in economy over oil-fired steam-equipped vessels; but it is anticipated that the change from coal to oil, as applying on the world's shipping, will be greater through the intermediate stage of oil-fired steam vessels. These should create a requirement of at least 10,000,000 barrels of fuel oil for each million tons of shipping, using oil as fuel. Practically all of the vessels in operation by the United States Shipping Board and under private American

ownership are substantially on an oil-burning basis, there being 49.4 per cent of these ships exclusively oil burners, 23.3 per cent coal burners, and 27.3 per cent convertible to burn either coal or oil.

In the use of fuel oil on board vessels, there are many economical features involved which would make the continuance of the use of oil as a fuel for maritime purposes of the greatest importance and which can be briefly summarized as follows:

(1) More economical operation and reduced crews.

(2) Greater cargo capacity of the vessel on account of its ability to carry oil in compartments not otherwise available for cargo, such as double bottoms, peak tanks, etc.

(3) Ability of vessel's propulsive equipment to render more continuous service, steady steaming and uniform speed, thereby tending to more efficient operation.

(4) Lessened wear and tear on vessel's equipment, machinery, boilers and reduced cost of upkeep.

(5) Less frequent painting.

(6) Preserving effect of oil on vessel's bottom, it being rarely necessary to undertake the most expensive item of renewing tank tops in oil-burning vessels.

Were the 55,000,000 tons of world's powered ocean shipping to be converted to an oil-burning basis, it would consume annually over 500,000,000 barrels of oil, which represents nearly the total quantity of petroleum produced in the world today. While this consumption could, of course, be somewhat reduced by a more universal adoption of Diesel engines, it would, nevertheless, be of huge proportions.—*Nautical Gazette*, 7 October, 1922.

MOTOR SHIPS SUPPLANTING STEAMSHIPS.—In spite of the severe shipping depression, motor-ship tonnage (full-powered ships 2,000 gross tons or over) increased thirty-seven per cent in the year ended June 30, 1922, as against a gain of only four per cent for steam tonnage exclusive of motor ships, according to an analysis of shipping by the transportation division of the Department of Commerce.

On June 30, 1921, there were 145 motor ships of 2,000 gross tons or over, aggregating 692,000 gross tons; on the same date this year there were 186, totaling 946,000.

The United Kingdom continues to lead with 36,000 tons, an increase of twenty-four per cent. Sweden registered a large percentage gain, but continues in third place. Norway has displaced the United States as fourth on the list. Germany which did not have enough motor-ship tonnage to appear separately in the list last year, has seven vessels aggregating 32,083 tons this year. Danzig has two ships of 12,078 tons; one of these is the *Zoppot* of 9,932 tons, one of the largest tankers in the world.

The above totals are for what may be termed seagoing ships. In addition to these are 605 vessels under 2,000 tons each, aggregating 234,325 tons, equipped with Diesel engines. Last year on the same date there were 553 vessels of this kind, totaling 216,110 tons.

The chief engineer of one of the largest British shipyards stated two years ago that he saw a promising future for sailing ships with auxiliary Diesel engine power. This kind of tonnage has increased from forty-five ships, totaling 13,000 tons on June 30, 1915, to 777 of 342,530 tons in 1921, and to 870 of 353,181 tons in 1922. The United States holds the lead in this kind of tonnage, with fifty-four ships aggregating 50,957 tons.

CONVERSION OF GOVERNMENT CARGO CARRIERS INTO DIESEL ENGINED SHIPS.—As announced in our issue of last week, the Shipping Board has

not received a single application thus far for an advance from its Construction Loan Fund, which at the present time amounts to $25,000,000 and can be availed of by reputable American shipping concerns desirous of constructing vessels of the best and most efficient type. In view of the low ocean freights now prevailing and the depressed state of the shipping industry, this outcome is not to be wondered at. When so shrewd a vessel owner as Sir William Raeburn concedes that high-class British tramp vessels can only be operated at a loss at this juncture, it is not at all surprising that American shipowners, whose operating costs are certainly on a parity with if not higher than those prevailing on British flagships, should be disinclined to invest money in new tonnage for which no employment could be found.

While the American merchant marine has certain operating handicaps to contend with, it possesses a far larger proportion of oil-burning and recently constructed vessels than any of its principal maritime competitors. With four-fifths of our shipping adapted to the burning of oil fuel and five-eighths less than five years of age, we can rightfully boast of having the youngest and most modern merchant fleet. But although we now lead in these two particulars, we shall lose this advantage in time if we rest content with our past achievements in the ship-building line. In the opinion of the best shipping experts, modern and up-to-date cargo steamers such as we possess are bound to be superseded before a great number of years by Diesel engined freighters whose operating costs are so much lower than those of similar steam-propelled craft. Astonishing as the statement may appear, not a single motorship has been laid up for lack of profitable employment during the past eighteen months, whereas hundreds of the best type of cargo carriers have had to be tied up for this reason. In the light of this experience it is clear that the nation which has the largest percentage of internal combustion ships is going to outdistance all others as a carrier of ocean cargoes. Instead of holding our own in this respect, however, we are trailing behind the United Kingdom, Denmark, Sweden and Norway in the amount of ocean-going motorship tonnage owned, while of the 103 motorships of 251,328 gross tons building in the world's shipyards at the end of June, only three of 9,298 tons were completing in United States yards.

Unless this country keeps abreast of the times by embarking on the construction of motorships on a considerable scale it will assuredly drop behind in the race for maritime supremacy.—*Nautical Gazette*, 7 October, 1922.

EFFECT OF PROHIBITION RULING.—Attorney General Daugherty's ruling is bound to prove very detrimental to our merchant marine, which has already so many obstacles to contend with. It will prevent the chartering of American passenger carriers for round-the-world or other pleasure cruises and deflect traffic from them by causing European bound voyagers from South America or the Far East to proceed to their destination direct instead of traveling via one of our ports. The manning of our coal-burning ships will be made difficult as Spaniards and other aliens, who form a large proportion of the stokers employed on American flag vessels, will certainly prefer employment on foreign steamers where they will not have to forego their daily wine ration. Our freighters will be forced out of the West Indian trade, where rum forms a portion of every mixed cargo and American tramp steamers debarred from transporting liquors will be less eligible for general chartering purposes than alien vessels. In the absence of an international agreement prohibiting the transportation of alcoholic beverages on all merchantmen, our shipping will be at a serious disadvantage in competing for the world's carrying trade if the

present regulations remain unmodified. Congress should recognize this fact and promptly pass remedial legislation if it desires our flag to hold its place on the sea.—*Nautical Gazette,* 14 October, 1922.

THE HAMBURG-AMERICAN LINE.—German shipping journals report that the present fleet of the Hamburg-American Line consists of forty-three steamers of a total tonnage of 165,707. 198,692 R. T. are under construction.

On September 4 the Hamburg-American Line re-opened its regular monthly service between Plymouth—Cuba—Mexico.

The *Cape Norte,* the new 13,502 T. steamship recently built by the Vulkan Werft in Hamburg, for the Hamburg-Süd-Amerikanische-Dampfschiffahrtsgesellschaft, makes its maiden voyage on September 14. The other two steamships of this company, the *Cap Polonio* and the *Antonio Delfino* are also in the South American service and form the quickest connection between Germany and Brazil, Uruguay, Argentine and Chili.

GERMAN MERCHANT MARINE PERSONNEL.—German shipping journals report that in the German Merchant Marine on ships of over 100 R. T. there are 2,367 captains and other officers; 1,087 engineers and machinists and 12,348 men. It is claimed that these figures represent about one fifth of the pre-war personnel.

FRENCH STEAMSHIP LINES.—The *Compagnie Generale Transatlantique,* 330,180 tons and seventy-nine steamers.

The *Messageries Maritimes,* sixty-four ships and a total of 303,700 tons.

The *Chargeurs Reunis,* with twenty-six ships and a total of 132,860 tons.

The *Transports Maritimes,* with twenty-five ships and a total of 91,900 tons.

The *Compagnie de Navigation Süd-Atlantique,* with ten ships, two of which are from 12,000 to 15,000 tons, the total amounting to 85,500 tons.

The *Compagnie Havraise Peninsulaire.*

The *Compagnie Française de Navigation (Fabre),* etc.

Aside from these, there existed, before the war, a commercial fleet composed of 642 steamers of at least 100 tons (total 947,205 tons), and 1,115 sailing vessels of at least fifty tons (total 460,253 tons).

ENGINEERING

CORROSION.—In view of the enormous importance of corrosion from every practical point of view, it is a matter for congratulation that after years of neglect considerable attention is at length being given to it by researchers, and fortunately they receive the necessary support, partly from such bodies as the Institution of Civil Engineers and the Institute of Metals, and partly from the Government Department of Scientific and Industrial Research. As a result, important advances in our knowledge of the nature and mechanism of corrosion have been made, notably by Dr. Newton Friend and Dr. G. Bengough. The latest report published by the latter—the sixth report to the Corrosion Research Committee of the Institute of Metals, presented at the recent Swansea meeting, and dealt with in our issue of September 22—is of special interest. When it is realized, as indicated above, that for most metals the occurrence of oxidation is a normal and almost necessary process, it is the study of inhibiting causes that becomes of primary interest. Such causes have been sought in two directions. For a very long time, the so-called "electrolytic" theory of corrosion was widely accepted, and differences of electric potential, either internal and local or external and general, were looked for to account

for all cases of rapid corrosion. No doubt in many cases such forces are at work, and the efforts made to eliminate them have proved successful to a limited extent. Thus the effort to reduce internal sources of electrolytic action by the use of metals of very great purity have met with only slight success; on the other hand, the application of external electric currents having a protective action has, in some cases, proved extremely effective. The actual application of such currents, however, is a difficult matter, and some of the most difficult cases of corrosion have not yielded to this type of treatment. More recently, the view that protection is to be sought by a study of the products of corrosion with a view to rendering them protective, in the same way as the oxide skin tends to protect aluminum, shows promise of greater fruitfulness. Although not, perhaps, evolved from any such considerations by its discoverers, it is held by some that the formation of a kind of protective coating or "passive" skin is the real secret of the non-corrodibility of the "stainless" or non-rusting steels containing chromium. In the great majority of cases, on the other hand, it is coming to be understood, thanks to the work of Bengough, that intense local corrosion may result from the accumulation of corrosion products which are not only non-protective, but actually accelerate corrosion. To find the explanation of many of these actions, appeal is now being made to the very modern science of the chemistry of colloids. To most of us, colloidal chemistry is suggestive of organic materials like glue and gelatine, but in recent years a colloidal chemistry of metals has also been developed. It is quite probable that the enthusiastic workers in that field may endeavor to carry their applications of this branch of chemistry too far; but Dr. Bengough—following, we believe, the lead of Dr. Newton Friend—has clearly shown that colloidal solutions—"gels" and "sols"—play an important part in many of the phenomena of corrosion. Nor is this surprising, when we realize that many of the products of corrosion, such as the metallic hydroxides which result from the oxidation of metals in the presence of water, are often met with in a highly gelatinous form. On corroded parts a "slimy mess" is at least as often to be found as a hard crystalline deposit, and it is—roughly speaking—with the understanding of these "slimy messes" that colloidal chemistry has to deal. Whether or not, therefore, the colloidal theory of corrosion affords the full and final explanation of the phenomena, there can be no doubt that the metallurgist, and indirectly the engineer, will be forced to take greater cognizance than hitherto of the chemistry of colloids.

Men of the older school, particularly when faced with such an array of highly specialized jargon as that adopted by colloid chemists, may be pardoned if they face the new viewpoint with some hesitation. The electro-chemical theory of corrosion was so easily understandable that if we must abandon it we shall do so with regret. Yet the history of scientific progress in connection with our knowledge of metals themselves must warn us not to "shy" unduly at a new array of scientific nomenclature. Not thirty years ago the infant science of metallography was widely ridiculed because of the list of "-ites"—"ferrite," "pearlite," etc.—with which its literature was adorned. To-day the scoffer is silent, and these terms are familiar to all metallurgists and even to some engineers. We must therefore face the intrusion of colloidal chemistry into metallurgy and engineering with an open mind, ready to learn and appreciate what it can teach us. These technical words employed by the chemist are, after all, merely convenient abbreviations or symbols; when the concepts behind them are understood, the terminology becomes not only a minor matter, but an easy one.—*The Engineer*, 6 October, 1922.

THE LARGEST MOTOR LINER.—The 600 foot, 18-knot motor passenger liner which the Fairfield Company is to build for the New Zealand-Vancouver service of the Union Steamship Company represents a distinct step forward in the development of the motor ship, for she is to be equipped with engines developing 12,000 brake horsepower, or about twice as much as those in any motor vessel so far built. The machinery, we are in a position to state, will comprise four six-cylinder two-stroke cycle Fairfield-Sulzer engines, each set developing 3,000 brake horsepower and running at 135 revolutions per minute. The cylinders will have a diameter of 27 inches and a piston stroke of 39 inches. The scavenging air will be supplied by three electrically driven turbo-blowers of such size that two will supply all the air required by the four main engines. The auxiliary machinery will include four two-stroke cycle Sulzer engines developing 400 brake horsepower each, at 200 revolutions, and will be direct coupled to dynamos. The main engines will be built in Glasgow by the Fairfield Company under licence from Sulzer Brothers, who will supply the drawings and certain parts. The auxiliary engines will be constructed at Winterthur.—*The Engineer*, 6 October, 1922.

INSTITUTE OF MARINE ENGINEERS.*—The changes that have taken place during the period of my service may properly be described as wonderful. Those changes have appeared in every direction, and most of them, it is pleasing to say, have been highly beneficial and useful.

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The principal changes that have taken place in naval machinery in the period I have referred to are:

(1) The general change from horizontal to vertical engines, the latter being of short stroke in order to keep the machinery under protection.

(2) The increase in boiler pressure and the change from compound engines to the triple-expansion type.

(3) The application of forced draught, in the first place to tank boilers.

(4) The use of locomotive boilers for a comparatively short period.

(5) The introduction of water-tube boilers and the evolution of the most suitable types.

(6) The use of higher speeds of revolution of reciprocating engines, together with many other devices for reducing weight.

(7) The more recent general introduction of steam turbines and of mechanical reduction gearing.

* * * * * *

It will be interesting briefly to consider the nature of some of the problems that will have to be faced in the near future by the marine engineer, and the qualities required of him in dealing with them.

(1) The reciprocating steam engine has reached such a stage of perfection that no radical improvement in its performance is expected, and those to whom it is an acceptable type will take it in its present satisfactory form with the greatest confidence.

(2) In order to combine a high turbine efficiency with a high propeller efficiency reduction gearing has recently been introduced. In this country the gearing has almost entirely been of the mechanical type, and in several cases it has brought with it its own troubles, troubles involving problems of a highly interesting character. They take the form of breaking and occasional wearing of the teeth. Experiences have varied. In the navy mechanical gearing has behaved satisfactorily.

*Excerpts from the presidential address delivered by Sir George Goodwin on September 12.

Other methods of effecting the reduction between the high-speed turbine and the slow-running propeller are also being used, chiefly abroad. In America, and to a small extent in this country, electrical gearing has been favored. It has some advantages over mechanical gearing, but it has also some disadvantages, especially at what may be termed the design stages. As far as I have been associated with such proposals they appear to be expensive in first cost and to require greater weight and space than in some cases can be allowed. Considerable economy in fuel has been claimed for this form of transmission, especially at low speed, and although there is no reason to doubt the accuracy of figures that have been published, care should be taken in making a comparison to ensure that the conditions and attendant circumstances are similar.

In Germany hydraulic gearing has been applied to some ships. One of them has been recently added to the Canadian Pacific Company's service on the Pacific side. Her performance will be of considerable interest, especially in the matter of fuel consumption, as the efficiency of hydraulic transmission is understood to be somewhat low, notwithstanding the heat-saving devices that can be utilized therewith.

(3) Steam boilers, both of the tank type and the water-tube type, have been highly developed in this country, and the efforts which have been made to obtain the benefit of superheated steam in marine installations, especially in the merchant service, have been most creditable alike to the designers and to the engineers in charge. The problem is affected in the navy by the fact that although a large measure of benefit can be obtained at full power, it has been difficult to realize any material advantage when the boilers are being worked easily at low power. It is hoped that recent successful experimental work can be applied in this direction with better prospects.

(4) In America very high boiler efficiencies have been claimed, under certain conditions and with special fittings, which, if maintained on service afloat, will put our engineers on their mettle, and in order to ensure that we shall maintain pride of place it will be necessary for the marine engineer, to whom this problem principally belongs, to have a very wide knowledge, not only of the methods of efficiently burning oil fuels, but of the nature of the fuels themselves, and of the conditions affecting their efficient and economical combustion.

(5) Oil engines for propelling and auxiliary purposes will compel profound consideration for many a long day, and in the near future discussions may take in large part a different form.

(6) The light oil engine has been fitted for propelling purposes in a large number of small craft, and although this application is not largely connected with sea going engineering, it is interesting to observe that the Royal Lifeboat Institution has decided, as far as financial considerations will allow, to proceed with a scheme for establishing motor lifeboats round our coasts, an action which is significant of the reliability that can now be placed on machinery of this type, and one which cannot fail to be of interest to all sea-faring people and which is deserving of their support.

(7) The methods of lubrication of rubbing surfaces have received considerable attention during the last few years, and the correct principles of lubrication are now better understood than they formerly were.—*The Engineer,* 6 October, 1922.

WORLD'S LARGEST MOTOR SHIPS BUILDING IN HAMBURG.—A famous German yard has just received an interesting order which means that this company is building the largest motor ships in the world. Furthermore, the yard holds the record for the amount of motor ship tonnage built during the year. The German firm received from a Swedish shipping

company an order for motor ships aggregating a tonnage of 54,000. They will be fitted with Diesel motors of the system Burmeister and Wain. The Deutsche Werft possesses the license for these motors in Germany. Amongst others, this order includes two large ore cargo steamers each of 21,000 tons, having a length of 550 ft. and a width of 70 ft., which are the largest cargo steamers so far built in Europe, and which, incidentally, on completion, will be the largest motor ships in existence. These steamers will be fitted with twin screws, and will have a speed of 11 knots. The ships will be equipped with the latest appliances for the transport of ore, and are intended for traveling between Sparrow Point, U. S. A., and Chile. The owners of the ships will be a Swedish company, Messrs. Brostrom and Son, Gothenburg, which requires the ships for the execution of a contract they have closed with the Bethlehem Steel Corporation.

The Company has also, during the last few days, received from another Scandinavian shipping company an order for two motor ships each 6,000 tons. The entire motor ship tonnage which will be launched this year, and which is still in construction is thirteen boats, having a deadweight of not less than 118,000 tons, which beats the record of any other shipping wharf in the world.

THE FLETTNER RUDDER.—In the description of the new Flettner type of rudder which recently appeared in these columns* reference was made to its installation in an 8,000-ton motor ship building by the Deutsche Werft at Hamburg.

The ship will be named the *Odenwald* and is for the Hamburg-Amerika Linie. The main rudder is of the balanced type and has an area of 154 sq. ft. The auxiliary blade is actuated through vertical and horizontal rods, the former passing up through the center of the main rudder stock. The vertical rod is actuated through a system of gear wheels and levers by wire-rope control from the navigating bridge, or alternatively from an after steering station, as shown. With the auxiliary blade in operation it is claimed that the power required for steering is less than five per cent of that for an ordinary-type rudder. Steering can be readily effected by hand, and the considerable cost of the usual power steering gear, including its upkeep and operation, is saved.

Under normal working conditions there is no twisting moment on the main rudder stock of the Flettner rudder, but provision has to be made for emergency steering should the auxiliary blade or its gear be disabled. To meet such an emergency the diameter of the main rudder stock must conform with the usual requirements of the Registration Societies and there must be emergency steering arrangements.—*The Shipbuilder,* October, 1922. *No. 144, Vol. XXVII, p. 76.

ELECTRIC DRIVE IN THE DUTCH NAVY.—Before a meeting of the Electro Technic Society of the Royal Institute of Engineers in Holland, Mr. W. F. Pott, Engineer-in-Chief of the Dutch Navy, read a paper giving a full description of the machinery of the submarine depot ship *Pelikaan,* just completed for service in the Dutch East Indies.

She is a vessel of 2,400 tons displacement, fitted with twin screws and driven by electric motors, the electric current being supplied by two dynamos coupled direct to Diesel oil engines. The switching arrangement enables running at reduced speed with only one oil engine running.

All auxiliaries are driven by electric motors, of which sixty-five have been installed throughout the ship.

The oil engines and practically all parts of the electric equipment have been made in Holland. The results of exhaustive trials were very satisfactory.

AERONAUTICS

SEAPLANE FOR SUBMARINES.—Among the inventions tested recently by the Department of the Navy and found to be satisfactory is a hydroplane so built that it can be stored in an undersea boat, or operated from the deck when the submarine is on the surface.

The plane has a wing spread of twenty-one feet. It can be "knocked down" and stored in a four-foot hold within five minutes. Within the same time it can be assembled and launched from the deck. It is a biplane, with the cantilever construction. There are no struts between the wings. The entire surface of the machine, wings and body, is covered with wood veneer. Both wings lift completely off. A quarter turn of a knob removes the propeller. The elevators fold alongside the tail. Four hooks remove the two pontoons. The gas tank is an entirely new departure. It is enclosed under the top wing. The plane is equipped with a five-cylinder Sennes Halske radial motor. It is air-cooled and develops fifty horsepower.—*Boston Evening Transcript*, 6 October, 1922.

THE NEW BARLING BOMBER.—There is about to be delivered by the contractor to the army air service at its engineering division at McCook Field, Ohio, the largest airplane ever constructed in this country. It is known as the Barling bomber, and it is driven by six 400-horsepower Liberty engines. It is a triplane, 120-foot spread, height of twenty-eight feet, and over-all length of sixty-five feet, and at least four men will be required to operate all equipment under service conditions. It is capable of carrying 10,800 pounds of bombs, in addition to gasoline, supplies, two pilots, and two passengers. With 2,000 gallons of gasoline, 5,000 pounds in bombs can be carried for twelve hours, or with reduction in gasoline and thus cruising radius 10,000 pounds of bombs can be carried for seven hours. The machine will be equipped with instruments to show the pilot how the engines are functioning, with a telephone to afford communication between the tail and nose and with radio for communication with the ground. One purpose of producing this machine is to obtain information as to design and estimating performance of such types.—*Army and Navy Register*, 30 September, 1922.

A CRUDE OIL AERO-ENGINE.—It is trustworthily reported that William Beardmore and Co., Limited, acting in conjunction with the Air Ministry, have after lengthy experiments and trials produced a promising type of crude oil aero-engine. The engine has not yet been officially tested, and so far details of its design are withheld. It is understood, however, to be a six-cylinder engine of 750 or 1,000 horsepower. It is known that the Air Ministry has for a long time been devoting close attention to the design and construction of engines using fuel other than petrol and similar low flash-point substances. At the Royal Aircraft Establishment experiments have been in progress for a considerable period on the use of shale oil in an engine operating on the Diesel principle. In addition, the Establishment has been conducting experiments on the solid injection of a fuel containing ninety-five per cent of alcohol. In other directions, too, a similar object is being sought, as, for instance, in the case of Dr. Ferranti's experiments on direct injection in a two-stroke cycle engine. The advantage to be gained by discarding petrol as an aero-engine fuel would consist not only of a diminution of the risk of fire as a result of an accident or of the penetration of the tank by a bullet, but also of an economy in running costs.—*The Engineer*, 22 September, 1922.

LOSS OF THE "C-2."—Washington, October 17.—The dirigible *C-2*, which was destroyed by fire at San Antonio, Texas, was the Army's best

and largest "blimp." It was completed shortly after the army's big Italian-built airship, the *Roma*, was destroyed, with a loss of thirty-four lives, at Norfolk early this year. The *C-2* had a gas capacity of 172,000 cubic feet and was capable of making a speed of sixty miles an hour.

The dirigible was on its return trip from a trans-continental flight, having made the trip from coast to coast in sixty-two hours flying time. Last July the ship made a non-stop night flight from Washington to New York and return, and in the fog narrowly escaped striking a smokestack and some of the New York City skyscrapers.

The length of the *C-2* was 192 feet and its diameter was fifty-four feet. It was equipped with two 150-horsepower Hispano Suiza engines, and was built for the Army Air Service by the Goodyear Tire and Rubber Company, at Akron, Ohio.—*Baltimore Evening Sun*, 17 October, 1922.

HELIUM.—From 8,000,000 to 10,000,000 cubic feet of non-explosive helium gas will be available within a year for the inflation of army dirigibles, Major-General Patrick, chief of the Army Air Service, reported today to Secretary Weeks.

The Secretary of War conferred with General Patrick in his effort to ascertain just what steps had been taken or would be necessary to avert through the use of helium instead of hydrogen such accidents as the destruction by fire of the dirigibles *Roma* and the *C-2*.

General Patrick explained that the envelopes of the dirigibles now in service permitted helium gas to escape. It was said the army has only 1,000,000 cubic feet of helium on hand.

The four new army dirigibles in the process of construction, it was explained, would be equipped with envelopes of a texture which would conserve the gas.

General Patrick also informed the Secretary that the Fort Worth (Texas) helium plant had recently resumed operations.—*The Baltimore Sun*, 19 October, 1922.

CHEAPER HELIUM METHOD.—A simpler and cheaper method of recovering pure helium from natural gas in only one liquifying operation has been perfected by the U. S. Bureau of Mines here, Dr. H. Foster Bain, director, has announced in a statement to the American Chemical Society that is interested in the use of nonflammable helium instead of hydrogen in our airships.

Whereas the helium plants erected during the war, and the Government Fort Worth plant now in operation, put the helium through two processes to make it of sufficient purity for balloon use, trial runs made within the last month in the Bureau of Mines cryogenic laboratory using perfected apparatus promise the easier, more direct method.—*Boston Evening Transcript*, 23 October, 1922.

NEW SPEED RECORDS.—The breaking of every existing record of speed, from one to 150 miles, adds just two more records to the bag of the United States Army Air Service. It now holds the altitude record, the endurance record, the speed record over a closed course for every distance up to 150 miles, and has exceeded, over a closed course of fifty kilometers, the world's straightaway record over a one-kilometer straightaway course.

Lieutenant Maughan's phenomenal race, averaging 206 miles an hour, breaks by over twenty-six miles an hour the previous record, held by an Englishman, J. H. James, flying a Gloucestershire *Mars I*. Lieutenant Maitland made one lap, his first last Saturday, at the rate of 216.1 miles an hour, beating Sadi LeCointe on the much-advertised Nieuport *Sesquiplan*, which made 214 over a straight course of one kilometer.—*Baltimore Evening Sun*, 17 October, 1922.

Brigadier General William Mitchell, assistant chief of the United States Army Air Service, set a new official world's speed record when he flew over a one-kilometer course at Selfridge Field, Mich., at an average speed of 224.05 miles an hour in four heats. The test was timed by representatives of the Federation Aeronautique Internationale, thus making the record official.

General Mitchell drove the Army Curtis plane which last week won the Pulitzer speed trophy and in which Lieutenant R. J. Maughan later drove unofficially at a speed of 248.5 miles an hour.—*Boston Evening Transcript*, 19 October, 1922.

NEW GLIDER RECORD.—Ilford, Eng., October 23.—The honors in the English gliding competition Saturday, fell to France and Holland through last minute efforts of their entries in which two new world's records were established. M. Maneyrolle, of France, smashed all existing records, including those of the Germans, by remaining in the air for three hours and twenty-two minutes in a *Peyret* monoplane. G. P. Olley, flying one of the *Fokker* biplanes, stayed up for forty-nine minutes with a passenger. —*Boston Evening Transcript*, 23 October, 1922.

ORDNANCE

RIFLE BORE CORROSION TEST.—The bureau of mines of the Interior Department has completed an extensive and important investigation as to the nature, causes, and means of prevention of the destructive corrosion frequently suffered by the bore surfaces of rifles through which modern, high-powered charges of smokeless powder have been fired. This investigation is the first systematic attempt that has been made to substitute scientifically demonstrated facts for the various unproved theories and some dogmatic assertions by more or less self-constituted authorities that have been prevalent ever since bore corrosion in high-powered rifles became a subjct of very great importance.

The report contains a wealth of information, which has been embodied in a pamphlet (*Technical Paper* No. 188) issued by the bureau of mines. Following is the summary of the experts:

A review of the scientific, patent, and trade literature and the compilation of the experiences of many practical riflemen has shown much confusion in the theories involved in the after-corrosion of firearms and much divergence in the practices recommended for prevention. Generally this corrosion has been attributed to acid products on the bore, although other explanations, including the action of chlorides, has been advanced. A critical laboratory study, comprising the exposure of fired rifles and fouled barrel sections to known humidities, the chemical examination of the corrosive residue, the use of special ammunition, and the analysis and testing of many "nitrosolvents" and other compositions recommended as preventives showed:

The present high-pressure smokeless cartridge leaves no nitrocellulose residue and no corrosive acid residue. After-corrosion following the use of such cartridges is caused by (1) the explosive deposition of a water-soluble salt or salts in whose aqueous solution the steel corrodes, together with subsequent exposure to (2) a high humidity and (3) the presence of oxygen. In the present service ammunition this salt is potassium chloride from the decomposition of the chlorate in the primer.

Such water-soluble salt or salts are retained in tool wounds and pits on the bore surfaces, in which they cannot be seen and from which they cannot be removed mechanically. They are easily dissolved by water or suitable aqueous solutions.

After-corrosion may also be prevented by keeping both ends of the bore tightly corked.

The present service ammunition can be rendered noncorrosive by eliminating the chlorate of the primer. It may be possible to develop a noncorrosive primer that will not affect the present ballistic properties of the cartridge. This point is under investigation.

A number of nonaqueous compositions recommended for cleaning firearms possess little or no value. Their supposed virtue seems to rest on tests conducted at humidities so low that no corrosion could occur.

After-corrosion proceeds below the dew point.

A simple test for differentiating between worthless and valuable cleaning compounds is described.

Corrosion from nitrocellulose powder occurs only when the confining pressure is extremely low, as in blank cartridges.

The study has shown that after-corrosion is closely allied to a number of other problems of corrosion beneath oil films and has indicated a simple method for eliminating the attending menace to many important iron and steel products other than firearms.—*Army and Navy Register,* 30 September, 1922.

NEW 14-INCH RAILWAY MOUNT.—In the new 14-inch railway mount, model of 1920, which was exhibited a week ago during the meeting of the Army Ordnance Association at Aberdeen Proving Ground, Md., and which soon will be put through a program of tests at that place, the army is in possession of a coast-defense weapon that is more universal in type than any that have gone before and of longer range than any carried on such a mount. The gun has a range of a little over twenty-six miles.

For several decades heavy long-range guns for coast defense have been mounted on carriages of one of two general types, namely, the earlier barbette or pivot mount, which appeared in different forms to suit various requirements, and later the disappearing carriage, which saw its highest development shortly before the World War. With the increasing ranges resulting from advances in ballistics, as well as with development of aircraft, came recognition of the serious inherent defects of the existing seacoast carriages. Foremost among these defects are their vulnerability to attack from above and their uselessness for action at points other than where they were mounted.

In the new carriage an effort has been made to overcome these defects. A mount has been developed that is mobile to a high degree over the railways and through the tunnels of the country, but that sacrifices none of the essentials of a modern coast-defense weapon. Among these essentials are that the mount affords an absolutely level platform that permits traversing without changes of elevation, a means of traversing at constant speed as slowly or as rapidly as desired by power, and loading and ammunition-serving facilities that insure rapidity of fire. In addition, it has features that do not appear in existing types. The concrete emplacement is of very simple form and requires no pit, thus avoiding the difficulties that arise from locations near sea level. Ammunition supply may be from fixed magazines in the vicinity of the emplacement as heretofore, or the mount may be served rapidly and continuously from ammunition cars, thus simplifying construction work and fortifications. Moreover, the new carriage may be used on a temporary field emplacement, thus supplying the need for a mobile weapon of extreme range and heavy caliber adapted for land operations.

The carriage itself provides for extreme elevations up to the maximum range of the gun, and traverse is provided through 360 degrees. All maneuvering may be accomplished by hand or by power supplied from

a generating plant traveling with the carriage.—*Army and Navy Register*, 14 October, 1922.

NAVIGATION AND RADIO

Short-Wave Radio Transmission.—Excellent radio transmission has been obtained by using waves of 15 m. generated by thermionic valves giving a power of 200 watts and an aërial current of 1 amp. After a successful attempt over land, a test was recently made from Carnarvon, Wales, to a receiving apparatus on a boat running to Kingstown, Ireland, and speech was received in that harbor, seventy nautical miles from Carnarvon. It had previously been found that the diminution in strength of the received energy was greater at low levels than at high, and it was expected that greater distances than seventy miles could be covered under suitable conditions on land. The result of a test between Hendon and Birmingham, England, was very satisfactory, and it was proved that the effect of the use of a reflector at each end was to increase the received energy 200 times.

The work with experimental stations is to be continued, and the results have so far been such as to make it clear that this new method of direction finding will certainly be developed further. The use of small wave lengths precludes the likelihood of interference from disturbance, but it introduces some difficulties in tuning of the receiving circuit.—*Electrical World*, 7 October, 1922.

Eliminating Static.—By the use of a so-called "resonance-wave coil" —essentially a complete and compact wireless antenna—the Signal Corps of the United States Army claims to have developed a method whereby "static" or atmospheric disturbances as an accompaniment of orderly radio communications may be eliminated. It is merely repeating a statement of universal acceptance to say that static electricity or atmospheric disturbances is the big retarding factor in the development of radiotelephony. This discordant element in the reception of wireless signals is operative from June to October—about five of the twelve months in the year.

The device of the Signal Corps for instituting proceedings effecting the divorce of orderly wireless signals and the crackling, meaningless noises, takes the form of a drain coil of wire. The incoming signals, for instance, from broadcasting stations, traverse the so-termed "resonance-wave coil" and then proceed to the conventional radio-telephone receiving outfit, irrespective of the design—vacuum tube or crystal set. The noteworthy thing, however, is that this coil of wire or compact antenna is of a discriminating caliber and only wireless signals are admitted passage into the radio-telephone receiver. The atmospheric disturbance or static electricity, discordant note that it is, is sidetracked and conveyed to the ground. Such are the claims made for this new form of "static eliminator." —*Scientific American*, November, 1922.

MISCELLANEOUS

The World's Navies.—Statistical comparisons of naval strength are in less demand nowadays than they were before the war. There is a widely-held though not entirely accurate impression that competition has ceased and the world's leading navies have become stereotyped as to dimensions for at least ten years ahead, so that the 5-5-3 formula is a rough but reliable guide to the relative strength of the three principal fleets during that period. It is felt, moreover, that the old method of computing the power of a navy simply by totalling up the vessels of each type is no

longer practicable, having regard to the great differences which now exist between individual units of any given type. To take a specific instance, we find that the designation "battleship," always a very elastic one, has to-day become all but meaningless unless it is carefully qualified. A sharp differentiation became necessary with the introduction of the all-big-gun type, and so we began to use the terms "Dreadnaught" and "Pre-Dreadnaught," to which was soon added the unofficial but useful tag of "Super-Dreadnaught," signifying a vessel armed with guns above 12 inches caliber. Now, thanks to the war and the technical progress to which it gave rise, we have had to invent other labels to distinguish battleships one from the other, and "Pre-Dreadnaught" and "Post-Dreadnaught" have each come to possess a very definite meaning. To a smaller degree the process of subdividing each category applies to every other type of fighting craft, the result being that the mere enumeration of its various ships conveys no trustworthy idea of the actual power of any combatant fleet.

These remarks are suggested by the recent publication of an Admiralty *Return,* giving particulars of the navies controlled by the chief States of the world. The complete document is informative, but the published summaries are apt to be misleading. Under the heading of battleships, for example, there are lumped together indiscriminately pre-Dreadnaughts of venerable age and post-Jutland ships of the very latest type. Italy is credited with twelve "battleships" and Japan with no more than eleven, in spite of which the Japanese group is at least twice as powerful as the Italian. Another anomaly is the inclusion among Japanese "battle cruisers" of three old 14,000-ton ships which have no real pretension to that imposing title except that they are officially listed as such in Japan. "Cruiser" is another term which covers an extraordinarily wide range of vessels, varying in this case from the *Courageous,* of 18,600 tons, to the U. S. *Charleston,* of only 9,700 tons. The task of classifying monitors appears to have caused the Admiralty compilers some difficulty, for under this heading are listed five Japanese vessels which bear no resemblance to our monitors, and are really old armor-clads disrated to coast defense status, a fact made clear in the return itself. But a certain confusion is inevitable when, as in this return, the British system of nomenclature is applied in some cases and foreign systems in others. It is only fair to say, however, that strict adherence to national designation in every case would probably have resulted in making confusion worse confounded so far as the lay public is concerned. Where the tables are both interesting and valuable is in relation to their exposé of comparative strength in the types which are not affected by the Limitation Agreement—that is, light cruisers, torpedo craft, and submarines, and a study of the figures here shown gives food for thought.

Our preponderance in light cruisers is considerable, possessing, as we do, fifty-one built and eight building, though many of the former are marked down for the scrap heap. Of ships built the United States has nine to Japan's twelve, but, while all the American vessels are obsolete the majority of those owned by Japan are of up-to-date construction, and as the light cruisers building for the two Powers number ten and thirteen respectively, the Japanese lead in this type is very pronounced. In destroyers the position is as follows: Great Britain—Built, 200; building, eight. United States—Built 315; building, three. Japan—Built, fifty-eight; building, twenty-eight. With regard to these figures it may be noted that a certain proportion of our 200 boats are probably ineffective through enforced neglect, and would need extensive repairs to make them fit for active service; that the Japanese total is apparently understated, and that ninety per cent of the American destroyers having been post-war built,

are probably in the best of condition. The submarine totals are even more significant. We have ninety-three boats built and eight building, the United States has 102 and thirty-eight, and Japan twenty-four and thirty-one. Here again there are discrepancies between the Admiralty *Return* and other sources, which credit Japan with many more than twenty-four completed boats. As it has been decided to scrap twenty-seven of our submarines this financial year, we shall then be left with but fifty-eight, only one of which is of post-war design. On the other hand, Japan will have at least forty boats and the United States about fifty boats, all designed since the war. If therefore, the submarine is destined to play in future naval warfare that important rôle which its champions forecast for it, our establishment cannot be considered excessive, and is in any case far below the ratio we claim in capital ships. This Admiralty *Return* serves, indeed, as a timely reminder that our margin of naval power has become exceedingly narrow and will not bear further trimming unless we are prepared to accept a position of definite inferiority in future.—*Naval and Military Record,* 20 September, 1922.

NAVAL DISARMAMENT.—Have we all been premature in assuming that the Washington Treaty had finally put an end to all rivalry at sea between the navies of the different nations, each of which was to be "rationed" according to the scale laid down by the Conference? America and Great Britain have accepted the ratio allotted to them, and Great Britain at any rate has set a splendid and public-spirited example in reducing her naval strength to limits which may prove to be even smaller than those the Washington Treaty assigned to her. But Brazil, which was one of the lesser naval Powers, the fixing of whose quota was left to the League of Nations, has formally notified the Disarmament Commission that she is unable to participate any further in any of the League's schemes or any international Conference for naval disarmament based on the Washington Treaty or the principles contained therein. The chief ground of her objection, as stated by Senhor Oliviera, her representative at the League Assembly at Geneva, are two in number, the first having reference to the limit on naval construction, the other to the prohibition of the construction of a new navy yard. The latter in particular is insisted on, because at present Brazil has no Government Dockyard, and the acceptance of the Treaty would prevent her from ever establishing one, and leave her permanently at the mercy of foreign nations for the supplies of naval ships. Hitherto, though her navy is not inconsiderable, Brazil has looked chiefly to British shipbuilders to construct her ships for her, and in the interest of our own shipbuilders we shall not be sorry if she continues to do so. But the ground of her objection is quite comprehensible, and it touches a point which the Washington Conference, carried away as it was by the enthusiasm aroused by the speeches of Mr. Hughes and Mr. Balfour, seems to have regarded as of secondary importance. Argentina has already withdrawn altogether from the League, and with Brazil in the same position as regards disarmament more than half of South America will remain unbound by its stipulations. Moreover, Chili and Uraguay have a plan to organize a Pan-American League of Nations in March, and if this scheme goes through, with the United States already outside the original League, the latter will have its operations confined, except as regards British territory on the American continent, to the eastern hemisphere, and as the American peoples both North and South, are rapidly growing in numbers, wealth, and power, they may very easily in time overtop the European nations altogether.

Moreover, there appears to be some doubt as to whether the naval agreements of the Washington Conference will be ratified by France. Ac-

cording to the French Admiral Favereau, who commanded a squadron in the North Sea during the war, public feeling in France is strongly opposed to ratification, for several reasons, of which perhaps the most prominent is that the datum taken as determining the relative strengths of the different navies in the future was that of the close of the war, not that of before the war, and was consequently highly unfair to France, which was then the fourth largest navy, coming next after America, before Japan and far before Italy, both of which added largely to their navies during the war. If the anticipation that France will reject the naval disarmament proposals should prove well founded, what becomes of the proportions so carefully drawn up to regulate the relative strength of the navies? Unless there is a common agreement for limitation it is difficult to see how the nations are to avoid the bad old system of naval rivalry, which put them all to the enormous cost of building against each other, without ever reaching finality or being substantially benefited in return for their outlay. Limitation of land forces has apparently been relegated to the Greek Kalends, nor, till Germany begins to carry out the Treaty of Versailles in good faith and the wars and rumors of wars in the Near East come to an end, is it possible to look forward to any immediate reduction in land armaments. But it had been thought that on sea at any rate there was a prospect of harmonious agreement to disarm. If this is not the case the hopes of a permanent peace will become weaker than ever, and the nations, in sheer fear of being caught napping, will begin once more the "mad race of armaments." If the League of Nations is to be really anything more than a glorified debating society it should take this question in hand at once and leave no stone unturned to secure general agreement upon a matter of such vast national and international importance.—*Naval and Military Record,* 20 September, 1922.

THE CRUISING ENDURANCE OF SUBMARINES.—Among the popular misconceptions with regard to naval material that prevailed before the war, none was more deeply rooted than the notion that a submarine boat could remain at sea only for a few days at a time, and therefore could not be employed in any operation which involved a prolonged absence from its base. This was one of the principal arguments with which Sir Percy Scott's critics sought to refute the sweeping claims he had made on behalf of the submarine only a few weeks before the outbreak of the Great War. It was put forward, not merely by civilian writers, but by several naval officers of high rank, and in view of this authoratative opinion it is not surprising that the general public came to regard the submarine as being useful only for coastal operations. Events soon showed, however, that the sea-going range of these vessels had been grossly underestimated. In the first month of the war German *U* boats were met with several hundred miles from their nearest base; early in 1915 they were encountered off the coast of Ireland, and by the spring of that year one boat had arrived at Constantinople after a voyage of 3,450 nautical miles from Wilhelmshaven. Meanwhile small British submarines built in Canada had crossed the Atlantic under their own power, and the *E-11,* of 675 tons, had made a trip in the Sea of Marmora—that is, in enemy waters—lasting thirty-one days. Then, a year later, came the cruise of the German *U-53* to the United States coast and back, a voyage of at least 7,000 miles, which was accomplished without replenishing the supply of fuel. It may be said, therefore, that the cruising endurance of submarines proved to be about ten times greater than pre-war forecasts had indicated. There is still some uncertainty as to the maximum period of time which a submarine spent continuously at sea during the war. The British boats on the Atlantic patrol frequently made voyages of well over one month's dura-

tion, while according to German accounts the first *Untersee-Kreuzer,* the *U-139,* made one cruise lasting six weeks.

Interest in this question of submarine endurance has now been revived by the remarkable performance of a French boat, the *Victor Réveille,* which was recently ordered to carry out a test for determining how long she could remain at sea. Leaving Cherbourg at the beginning of July, she arrived at Toulon on August 31, after an uninterrupted voyage of sixty days. This, so far as is known, constitutes the longest voyage which has been made by a submarine up to the present date, though it need hardly be said that peace conditions are far more favorable for such a test than those which obtain in war. The *Victor Réveille* was formerly the *U-79,* and is one of the many ex-German submarines now under the French flag. Completed at Hamburg in 1916, she belonged to a group of ten boats which were especially designed for mine-laying, and one of which sowed the mines that sank H. M. S. *Hampshire,* with Lord Kitchener on board. The performance of the *Victor Réveille* is the more noteworthy in view of her modest dimensions. On the surface she displaces only 755 tons, increased to 833 tons when submerged. Her length overall is 186ft. 4in., the breadth 19ft. 10in., and the draught 15ft. 1in. She is therefore less than two-thirds as long as a modern destroyer and some 10ft. narrower in beam. The propelling machinery consists of two sets of Diesel four-cycle six-cylinder engines, developing 900 brake horsepower, which gives the boat a surface speed of 10.6 knots. For submerged propulsion the electric motors develop 800 brake horsepower for 8 knots. In his paper on German submarines, Mr. A. W. Johns, R.C.N.C., said that the class to which this boat belongs differs from all the ordinary *U* boats in having internal main ballast tanks. They have a pressure hull of large diameter—16.4ft., as against 13.5ft. in *U-161*—and small external saddle tanks, which, instead of carrying water ballast, carry oil fuel. The two main ballast tanks are internal, the larger extending under the mine room and up the sides of the motor room, while the other is under the engine room and partly up the sides of that room. With a full load of fuel, amounting to eighty-seven tons, the nominal range of the *Victor Réveille* at an economical speed of 7 knots is 7,800 miles. It is not yet known what distance she actually covered in the course of her sixty days' voyage, but it is evident that had a speed of 7 knots been maintained throughout, the total run would be 10,080 miles, or 2,280 more than she is supposed to be capable of making on one load of fuel. In point of fact, the radii of all the German boats with which our experts have had experience have proved to be substantially larger than the official German estimates, and there is more than a suspicion that their actual endurance was purposely minimized for obvious military reasons. That the submarine possesses a much wider radius of action than any surface warship of equivalent size is now well known, but it is doubtful whether the full extent of her advantage in this respect is commonly realized. She derives it mainly, of course, from her internal combustion engines, which at low power are very economical in fuel consumption, while the structural arrangement of the hull is well adapted to the carriage of a large supply of oil in proportion to the displacement. Official data published since the war show that great cruising endurance was aimed at in the design of all German submarine types. In the *U-29,* a typical *U* boat of 675 tons displacement, the endurance at an economical speed of 8 knots was 9,800 miles. In the *U-43,* of 725 tons, it increased to 11,250; in the *Untersee-Kreuzer,* Nos. *139* and *142* it was respectively 18,000 miles at 8 knots and 20,000 at 6 knots. Still more remarkable were the corresponding figures for the smaller types; the *UB-18,* of only 272 tons, was credited with an endurance of 7,000 miles at 5 knots; the *UB-48,* of 516 tons, with 9,000 miles at 6

knots; and the *UC-16,* of 410 tons, with 8,700 miles at 7 knots. These are boats whose limited dimensions would seem to put them in the category of coastal submarines, yet they were nevertheless capable of voyaging for many thousands of miles. The longest-range submarines built in Germany appear to have been the Deutschland and her six sister boats, originally designed as submersible cargo ships, but afterwards converted into fighting craft. Although of only 1,510 tons displacement, their fuel supply was sufficient for a continuous run of 25,000 miles at a speed of 5½ knots. However, when estimating the sea endurance of small vessels, whether of the surface or submersible type, it is necessary to take other factors besides the mechanical into consideration.

That a boat such as the *UB-18* could really make an uninterrupted voyage of 7,000 miles may well be doubted. Owing to the cramped accommodation below and above deck, the difficulty of ventilating the narrow interior spaces packed with machinery, the noise of the Diesel engines, and the violent motion of the boat in rough weather, the health of the crew would inevitably begin to suffer after a few weeks at sea. In other words, the human element would be liable to become exhausted long before the mechanical element had reached its limit. In time of war the conditions of service on board would, of course, be infinitely more trying; there would be a constant strain on the nerves of the men when they were at sea, especially in enemy waters, and therefore had to spend most of their time under hatches. The actual radius of any type of submarine in war time would therefore depend primarily on the mental and physical stamina of the complement, which implies that it cannot be fixed with any degree of precision. But as submarines increase in size, enabling better living quarters to be provided and setting free more space on deck for exercise and recreation, the conditions of service tend to become more tolerable, and there is consequently less likelihood of a breakdown occurring in the health or *morale* of the *personnel.* There is no visible reason why a very large ocean-going submarine should not be able to remain at sea as long as her fuel holds out, without imposing any superhuman strain on the *personnel.* On the other hand, if dimensions are increased beyond a certain limit the submarine becomes difficult to maneuver below the surface and requires to be navigated with extreme care in all but the deepest waters. For this reason every navy will no doubt continue to build boats of moderate size—say, up to 1,000 tons—for general service, while at the same time developing the large submersible cruiser type for special overseas operations. This division of types seems, in fact, to have been adopted in the United States, France and Japan, following the example set by Germany during the war. Although the prospect of a long period of peace has naturally slowed down the development of the submarine boat, steady progress is still being maintained, and there are boats now under construction abroad which appear to be little if at all, inferior to the German submersible cruisers in respect of sea endurance. The advent of submarines capable of crossing and recrossing the Pacific Ocean with a margin of 10,000 miles to spare promises to introduce a new and complicating factor into naval strategy.—*The Engineer,* 15 September, 1922.

ITALY'S INTERESTS IN NEAR EAST.—*Il Messaggero,* a semi-official Roman daily, said in a recent issue: "Every country has its own particular program. Italy has a program to submit and defend which can be summed up: 'The reconstruction of Turkey.'" The article goes on to say that: "The British anti-Turk policy must give way to a policy of National justice in the common interest of Europe. This policy of justice will commence by the re-construction of Turkey, the re-instatement of the Sultan at Constantinople, and the return to Turkey of all Musulman regions in Europe and Asia."

With respect to Anatolia, Italy's interest will be served by seeing Greece ousted from Smyrna. Italy has lost that trade center since its occupation by the Greeks. Furthermore the presence of the latter there tends, in the opinion of Italians, to destroy the equilibrium in the Eastern Mediterranean which is an essential point in Italy's foreign policy. Italy feels that with the Greeks out of Smyrna there is a chance that she will be placed again in the position accorded to her by the treaty of St. Jean-de-Mauriene, or even if the Turk retains Smyrna that, by championing his cause, she—Italy—may be accorded special trade privileges there.

Il Mondo, a conservative, able paper, with Nitti tendencies said, recently, "As far as Constantinople is concerned, it is certainly impossible to conceive of a Turkish State with its historical capital either occupied by foreign troops or strangled to the extent (to quote here the elegent expression of M. Venezelos), 'of having barely sufficient air to breathe.'"

General Bencivenga, who has written extensively on international topics, has a leading article in *Il Paese:* "The freedom of the Dardanelles, evacuation of Thrace by the Greeks; re-establishment of normal relations between Christians and Musulman," sums up Italy's interests. He contends that the freedom of the Dardanelles is essential since the Black Sea is the natural area for Italian commercial expansion. For this reason Italy cannot consent either to allow the Turk to be master of both sides of the straits or to tolerate the permanent establishment there of any great power. With respect to Thrace: Italy, which is very sensible to Balkan disturbances, cannot consent to the state of unstable equilibrium that results from Greece's possession of Thrace, a territory, which because of its strategic position and Greece's military situation, she cannot hold. Furthermore, the writer says, it is in Italy's interest that Bulgaria has an outlet to the Aegean Sea.

"DON'T GIVE UP THE SHIP."* By Brigadier General George Richards, U. S. M. C.—This is the third time I have had the pleasure to appear before the officers undergoing instruction at this command. There were two subjects it was my endeavor to talk about before—one was "Initiative and Leadership"—the other was "Administration." As to the talk of to-day, it may have a subject, but I do not venture to give it a title. A year ago I tried to express here one dominant thought, one idea that seemed to me we might write down as a work-a-day principle to guide us in the solution of problems confronting us in the building up of a new Marine Corps, problems that to a large extent must be successfully solved solely by us. We were to take counsel with ourselves to meet these great questions. For, when people get together themselves and collect their individual forces together, the thing they aim at doing is usually the thing in the end that is accomplished. There was once a story told, one of Æsop's fables, I think, about the man with seven sons. You remember the boys—as they grew up or were growing up, they could never agree—always they were found bickering amongst themselves. You will recall the father's method of illustrating his point. How he brought seven sticks, each of which he separately broke with comparative ease. Then the old gentleman went further, taking seven more faggots, he bound them together. Not one of his seven sons had the strength to break the bundle! So it is for unity I stand here to-day!

The war brought home to many of us older officers lessons of great importance that recalled our earlier experiences. There were we who stayed at home to keep for you the home fires burning, so to speak. We who served here while we waited. And then there were you who

*Address delivered at Marine Corps Schools, Quantico, January 19, 1922.

so valiantly bore on the front line our Country's honor in France! How proud we were of your achievements! Now, let me tell you here of the finest thought that was brought back from France to me. It came from one of you who had helped so well to bear that burden Over There. This was his thought—"That Fourth Brigade, that apparent raw material we took to France. And it is true we trained it there for a year under our own eyes for the task for which we were sent. Then with the perfect or almost perfect instrument it was, we were thrown against the Germans. The reward for what was done there—the distinction and the glory that came out of it all was ours—all! But the credit, there's the rub—the credit I do not think we may rightfully claim. That belongs to many who never put their feet on the soil of France. The Fourth Brigade was the product of thirty or more years of constant and united endeavor of all of the Marine Corps, all working together in one earnest effort." Now that seemed to me, a home-fire burner of some thirty years of activity as a most gracious compliment to all of us and a compliment very tactfully extended. I cannot ever forget it. I think, though, I should tell you my answer. "That organization, the Fourth Brigade," I said, "was not the fruit of thirty years of effort, not by any manner of means." It was the work of 146 years. Back I would go to the very beginnings. Back to those men whose names are now almost forgotten, men who for years have lain in their graves. They laid the foundations upon which our building began. What names for us to conjure with! Samuel Nicholas—William Burrows—Franklin Wharton—Archibald Henderson—Presley Neville O'Bannon! That last name—it brings to me an incident of recent years. You might yourself be put some day in a situation where you are about to be hurried or stampeded into doing something your judgment does not accept. There were people who wanted to change the uniforms and they were advocating a new sword, a more practical weapon. Their arguments were sound or seemed so. There was no answer. But someone was reading from the uniform regulations descriptive of our sword, our so-called obsolete weapon. A sword with mame-luke hilt curved blade and metal or nickeled scabbard—"Don't you think that sword had something to do with Presley O'Bannon? He who with his Marines made those Arabian mame-lukes into soldiers and with them stormed the Fortress at Derne 'On the Shores of Tripoli?' And hoisted for the first time the American Flag on a Fortress of the Old World?" That question was enough. It stopped the movement and, as we looked further into the matter and in detail, we found this to be true—that sword of ours of today is modeled from the very sword presented by the State of Virginia to Lieutenant O'Bannon of the Marine Corps in recognition of that daring exploit! We are not likely now ever to lose it. For the memory of Tripoli is something that we shall preserve in our history so long as there is an American Marine!

But I was speaking about France. This is what I would say. The friendships formed on those front lines are as bonds of steel welded by fire to keep you who served there together always. Your deeds in France must be told and re-told to one another and you must gather and regather that their memory be preserved. As the whole Marine Corps preserves in that sword the symbol of our common heritage from O'Bannon so would the whole Marine Corps help you to preserve through the memories you recount of France an inspiration for the Marine who is to come after us. There are no two schools of thought in this—no two schools such as I mentioned when I was last here at Quantico. The Marine Corps in its approach to line and staff questions—that was what I was then talking about—the Marine Corps in its approach to all questions upon which we might be led to divide puts forward but one thought, no other

thought than this, "we are all for one and we are one for all." I am going to try to put myself back to my own days of twenty odd years ago, just for a moment. Just after my Philippine days and more particularly the times of the Boxer War—for my closest friends in the Marine Corps to-day are those that I served with in China in those stirring days of the summer of 1900. The Ninth Infantry, for instance, that fought alongside the Fourth Brigade of Marines in France was with us then. So was the Royal Welsh Fusileers that furnished the Guard of Honor when General Pershing first landed on British soil in 1917. Those Welshmen I liked because they had been Marines in the War of the Revolution. I am not going to tell you their story here; I am going, though, to speak of an incident after those China days were over. I was on the old White Star liner, the *Gælic,* returning home. It was full of missionaries—men and women thrown out of the interior of China by that great upheaval. Amongst them was an old Methodist parson, who had served fifty years there—he had rarely in this time seen or spoken with one of his own race. He was a man, active, zealous and earnest. He was one who believed in his work, a man of broad mind not influenced by prejudice. He told me a story I want to leave with you to-day. He was to build a little mission. He wanted bricks. Finally, he came in contact with a Chinaman, a brickmaker, who sold bricks. The missionary was disturbed over the quality of the goods he was to buy. Finally, he said to this Chinaman—"Are you sure you can make me good bricks?" I can picture that brickmaker in his reply. Drawing himself up to full height, with great dignity, with pride in his eye, and in his speech, he said: "I have made bricks for eight hundred years." And my missionary friend added to me—"So he had, he and his father and all his forefathers before him, they had made bricks, and all that the family had developed for thirty generations in the making of bricks that skill was the proud possession of this Chinaman." Of course, such a man could make good bricks!

We all here will remember Mr. Gilbert Wilson who taught the Marines of Quantico to sing. Let me tell you what he once told me. He said that the first words of that song; I never, never heard the song without a thrill comes over me—its first words—

"From the Halls of Montezuma,
To the shores of Tripoli;"

there are just ten of them. Wilson said to me, "There is your *morale,* there is your *esprit,* all in those ten words, history, tradition, everything." I read of the wounded from Belleau Woods being carried into the hospitals in Paris singing the Marine's battle hymn. In reading I knew, I understood, though I did not see! "History, tradition, everything." No, we "stay at homes" did not see. But how proud we were and what an honest pride we have now. How we pictured you, how we tried to follow you. We heard you had been broken up and made the military police. That we did not like—we had known of its evils for us in our efforts to assimilate in the Navy the soldier with the sailor. Finally we heard that you had had to send your General, the Marine General, the late General Doyen, home broken in health and that an Army General was to command you. That depressed us, but as it was not a new experience in our life to be commanded by an officer from another service we were, though depressed, not impatient. We felt better, though when we heard the compliment paid you in that General Pershing's Chief of Staff, General Harbord, was your commander. I'll not follow you further in detail—only this would I say, the Army more than doubled that compliment after you had done so well in June of 1918, for then they gave to the Marine Corps, to General Lejeune, the command of an Army Division,

two-thirds of its officers and men being of the United States Army—there was a distinction never before conferred upon the Marine Corps, never before had a mixed force—such a mixed force as we were accustomed to in our life or experience in the Naval service—ever been commanded by an officer of the Marine Corps! And even if your identity as a Marine was then lost in that great organization and we could not follow you further, we never ceased then or now to take pride in the achievements of the Second Division. Your worth as a Soldier was not to be questioned by anyone! Of that we were sure and we were secure! It seems now—as I hesitate—that I have not come down here to talk to you—I am here just to tell stories. I said you saw a lot that I did not see nor could I visualize—I mean in France. There was something we heard about that was there. It was a very necessary article, it seems. Not exactly an incinerator, or even a pot boiler. It was a machine to steam the soldiers' clothing, *all of them,* when opportunity availed and it had an ugly name. Well, before I get ahead of my story—there was a marine sergeant or a doughboy, it may have been, who was strong on history. He knew all the historic utterances of heroes of almost forgotten wars. He could say most of them, and it seems they all came from the Navy; he must have been a Marine! "Damn the torpedoes." "You may fire when ready." "There is glory enough for all"—these he could readily repeat. Well, his company had come back from the front line trenches. The men were all disrobed for their bath. Their clothing was being gathered up when this machine hove in sight. They cast the machine loose and started the fire to make it function. The men were all very much interested. They had gathered about in their birthday raiment, I suppose you who were there know exactly how they felt. As their clothing was being dumped into the machine they began to cheer! It was the sergeant's opportunity; he mounted the machine and shouted: "Don't cheer, boys, the poor devils are dying."

I don't pretend to be very strong on historic sayings. There is one, however, I can never forget. It also came from the Navy. I was born in the State of Ohio, down on the Ohio River. I grew to fifteen years of age with a little knowledge of the Navy and none whatsoever of the Marine. That seems strange to me now, for I well remember the story in McGuffey's Fourth Reader about the Mutiny in the Massachusetts State Prison in 1824 and of Wainwright. But I did not associate him then with the Marines. In those days in fact I never had seen salt water. But the county in which I was born and grew up was named *Lawrence.* My father, an old Welsh Quaker, was born in Chester County, Pennsylvania, but had settled in Ohio at the age of ten, with my grandfather—he told me for whom the county was named—it was for James Lawrence; Captain James Lawrence of the United States Navy. My father told me how James Lawrence had died on the quarterdeck of the ship *Chesapeake,* pierced by a musket ball in an engagement off Boston harbor with the British ship, *The Shannon.*. And he spoke to me of Lawrence's heroic words, which have become immortal: *"Don't give up the ship."* In such circumstances I shall never forget them.

Do you know how or why the Marines were sent to France to serve with the Army there? Let me tell you the truth. It was not so much because the Army needed you there, for indeed they had asked for you. It was because the General Board of the Navy decided that the best training the Marines could have for their distinctive duties in connection with future operations of the Fleet was that to be afforded in actual warfare in France. You went there when the Army called for all trained troops available, but you went there for strictly naval purposes—let me repeat "Strictly Naval Purposes," that was why you went to France. Let me most forcibly impress this upon you!

Last November, for the first time in my knowledge, the Marine Corps celebrated its birthday. You remember the terms of a very inspiring Marine Corps Order issued on November 10, 1921? That was our one hundred forty-sixth birthday! What I would here draw your attention to concerns the circumstances under which we were instituted and the reason for which we were brought forth. The War of the Revolution was distinctively a conflict that ended in the favor of the side that mastered the sea. No one makes that clearer than Mahan. No one recognized it with greater force than George Washington himself, for to Admiral De Grasse, commanding the French Fleet at Yorktown, he unselfishly gave the credit for that victory—a credit history persists in granting to others.

But in 1775 the Corps of Marines sprang into existence. In the resolution that created the two battalions of those days, it was specified "that particular care be taken that no persons be appointed to offices, or enlisted into said battalions, but such as are good seamen, or so acquainted with maritime affairs as to be able to serve to advantage by sea when required; * * * that they be distinguished by the names of the First and Second Battalions of American Marines."

Let me lay here a little stress on these words of our Fathers—"So acquainted with maritime affairs as to be able to serve to advantage by sea when required," for I am going to depart just a moment from my text and indulge myself in a bit of sentiment. While we are perpetuating in the organization of the Marine Corps the illustrious name of the *Fourth Brigade,* it might be wise for us now to recreate somewhere two units with the object to perpetuate those organizations of the Continental Congress: "The First Battalion of American Marines, and the Second Battalion of American Marines." Only once in the history of the Marine Corps did Congress create for it distinctively military units. I have just described the occasion. Let me pursue that sentimental thought a little further. Do you know that the First Flag of the Continental Navy came from the Marines? That is true, though there are people who would dispute it. Back in the days before the Revolution, at the time of our birth in 1775, before even the Declaration of Independence was written, before even the United States of America could be so called by name, we have the story. Benjamin Franklin wrote that he had observed on one of the drums belonging to the Marines whose recruiters were raising these two battalions, there was painted the rattlesnake with this motto under "Don't Tread on Me!" Franklin said, knowing it was the custom to have some device on the Arms of every Country that he supposed this design was intended for the "Arms of North America." That corps of drummers often marched the streets of Philadelphia in those days "drumming up recruits." When later, Congress created the Continental Navy, that device of the Marines became the design of the Flag that flew from the mastheads of our first ships of war.

So I think it safe to say it was for sea service the Marine Corps was created and that it has been sea service that has perpetuated him. And it is equally safe to venture that want of proper sea service or "acquaintance with maritime affairs so as to serve to advantage at sea if required" will be a means through which his existence as a Marine may terminate.

The fleet of to-day is not the fleet of a century ago. Naval science presents a variety of new conditions. No longer can the Fleet of the Line maintain itself in readiness for conflict for such extended periods of time or in so wide an area as did the fleets of Nelson and Collingwood. The modern fleet required different methods through which its area of sea control may be extended. A base of operations, a rendezvous for repairs, is still, as before, an essential. But something further is required.

The modern fleet required different methods through which its area its power, its radius of control or action, through the establishment of advance bases, temporarily fortified, at a distance from the main base. Here lies the most important auxiliary service for the Marine Corps, a service you here at Quantico are trying to develop through intensive training of the commissioned and enlisted force of a unit you have established. The need to the Fleet of a mobile force, armed, equipped and trained for the purpose of seizing and defending the advanced base is now a prime necessity of all strategic or tactical plans. Such a force, not drawn from the personnel of the ships of the first line, but separately organized, transported and maintained as a distinctive tactical unit of the Fleet, known as the Advanced Base Unit, is a most important fleet auxiliary.

That the Marine Corps to-day is a mobile force, ready to move at the moment's notice, is due to its sea habit, its naval *esprit,* acquired by its officers and men in their varied service as part of the complements of sea-going vessels of the Navy. This has been developed in a distinctively naval atmosphere. This naval *esprit* has been diffused throughout the rest of our personnel. It is with great satisfaction to observe how well this process is progressing here at Quantico. The experience the Marine and the Marine officer gain at sea as an inherent part of the complement of sea-going vessels of the Navy is an asset to the whole Marine Corps and to the Navy. It is an asset that could not be exchanged for anything else except at the sacrifice of the efficiency of both the Navy and the Marine Corps—the entire Naval personnel. It is only through such a service that the true perspective is to be gained, that the naval purpose of the Marine is visualized. The educational opportunities of the life of the Marine Officer in the ward-room mess, to say nothing of the lasting contacts and friendships that are there formed for us, cannot in their worth to the Navy be overestimated. It is these conditions that have brought forth in the Marine of these times, officer and man, the qualities that go to make up a highly trained efficient force of naval infantry, or artillery instantly available for naval use. Such a force as we now have in the Marine Corps with its naval *esprit,* its familiarity with naval customs, the uniform, the precedents and traditions of the sea is a force that will be controlled in future naval operations by the one mind that directs the campaign, the Commander-in-Chief of the Active Fleet. Questions of divided authority, which the history of all nations show to have been involved in joint operations of distinctly land forces with sea forces, cannot arise. With the Marine Corps as it now is and as you here at Quantico are making it in the training of the advanced Base Force, the Navy cannot fail to have perfect co-operation. You are not being maintained here as a land force separate and distinct from the Navy. The whole plan you follow here in your training of that unit is one established in detail by the proper technical Bureau or Office of the Navy, located within the Navy Department. This plan is being worked out by the Marine officer in the closest of liaison with the Navy Department and more particularly the Fleet. I would that all the Naval service were conscious of what you are developing here under such favorable auspices, an instrument necessary for the Fleet. An instrument vital for success in whatever duty our Country's welfare may lay upon the Fleet.

In getting together with the Navy in this admirable way you are carrying forward their great work here at Quantico, you are fulfilling my fondest aspirations—*Don't give up the Ship.*

The together idea, I told the last class here was the progressive idea. When interests are divided or forces are distributed, ruin is not far off. But as we naval officers (for Marine officers are Naval officers) draw all our forces together, the power of the whole naval organization is

increased and we shall get there. And there was another thought I felt here on my last visit, and that was this—that there is plenty room in this great organization for all to live and work in happiness and in peace. There was a time as I was growing up in this Marine Corps that it did not seem so to me. I mean when we were trying in our poor way to do what is being done so admirably here to-day. When we were endeavoring to develop the Marine Corps for the Navy. When we were trying as best we could to save the Marine Corps for the Navy, with elimination absorption abolition stalking at our heels. There were those of the Navy who would not help us, for it seemed then it was the irrepressible conflict of the "sailor and the soldier" within the Navy. The details are too lengthy to repeat, they would serve no good purpose here. But I would have you know there was a final paper written that seemed then to end the conflict happily for all. That paper was completed on July 23, 1913, the anniversary of the birth of General Grant, a great soldier. Two days later, the General Board of the Navy in an admirable report put the entire question officially at rest. Something written in that paper, for it was printed—it was my own, I would now read to you. The words include one more historic saying by Grant (not the Navy this time). What was so written was for the same object as of my talk to-day; here are the words: "Twenty-eight years ago, on July 23, 1885, there died one of the most illustrious soldiers our country has produced. Our fleets received on North River, beneath the shadow of his tomb, the plaudits of the Nation for our victories as against the ships of Spain. He was a man of great deeds, but of few words. Having crushed at Appomatox the most formidable opposition to Federal authority, having vindicated by force of arms the policies of his Government, he united in common interest the discordant elements of his people and endeared himself to his fellow-countrymen for all time, saying: 'Let us Have Peace.'"

I say God-speed to you in the work you are here doing in peace for the Navy; in the building up on safe and sane foundations, under a doctrine expressive of plain common sense what is essential for the future of the Marine Corps. You are doing this in the exercise of moderation and self-restraint—you are suppressing prejudices, rejecting passion and emotion—even hair-trigger judgment in this real reconstruction of the Marine Corps for the purpose of the Navy. Now as a final word, only the other day I read, as New Year Resolutions for everybody, something I have brought with me for you. You are living up to all they express in your daily conduct in this work of reform. Here they are:

Resolved, that in the year 1922 I will think things out.

That I will be wise enough to withhold judgment until I have all of the facts and that I will be sure the facts are genuine.

That I will not permit my solid judgment to be swayed by my personal feeling and that I will spurn every effort of self-seekers to gain my favor by attempting to arouse my prejudices.

That I will do my own thinking and not permit myself to be stampeded into any opinion by anyone on any pretext whatsoever.

And so God giving me courage, I will be a solid American citizen, unafraid, going forward with faith, believing in my country and my fellow-men, doing unto others as I would have others do unto me.

I thank you one and all.

CURRENT NOTES AND PROFESSIONAL PAPERS

"A New Electric Immersible Pump"—(A description of the new pump patented by Mr. Reed Cooper of London and built for General Duty in the Naval Dockyards of Japan.)—*The Marine Engineer and Naval Architect,* October, 1922.

"Lubrication"—(A technical discussion of the subject, from the Research Laboratory of Applied Chemistry), by Prof. R. E. Wilson and Daniel P. Barnard, in *The Technical Engineering News,* October, 1922.

"Bearing Design and Lubrication"—(An analysis of pressure distribution, effect of variation of pressure and velocity on the coefficient of friction, and the design of modern bearings as applied to motion.) by William Foot, Power Engineering Department Westinghouse Co., in *The Electric Journal,* September, 1922.

"The Washington Conference and Far East Questions"—(A brief survey of the conference as related to far east questions.) by the Rt. Hon. Sir John N. Jordan, G. C. I. E., British Minister to Peking 1906-1920, in *The Quarterly Review,* July, 1922.

"Great Britain and the United States"—(An Englishman's idea of the eccentricities of American policies during the World War, Paris Conference, and Washington Conference) by J. A. Spender, in *The Edinburgh Review,* July, 1922.

"Reduction of Armaments: Our Military Position"—(An argument against Lord Esher's proposals for disarmament), by Brig. General F. G. S. Stone, C. M. G. and Capt. G. S. C. Swinton in *The Nineteenth Century,* October, 1922.

Pertinent Articles in:—

The North American Review, for November:
"The New Mediterranean," by Bruno Roselli.

Current History, for October:
"Our Merchant Flag on The Seas," by Albert D. Lasker.
"Radio Marvels of the Modern Navy," by C. A. Tinker.
"Atlantic and Pacific Sea Power," by W. H. Gardiner.

Revue des Deuse Mondes, for October:
"Un Programme de Renovation Navale," by René La Bruyère.

La Revue Maritime, for September:
"Le Droit et les forces," by Coutr. de la marine A. Le Héuaff.

NOTES ON INTERNATIONAL AFFAIRS

FROM SEPTEMBER 25 TO OCTOBER 25

PREPARED BY

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NEAR EAST

ARMISTICE SIGNED AT MUDANIA.—On October 11 an armistice agreement ending hostilities between Greece and the Turkish Nationalists was signed at Mudania, on the Sea of Marmora, by military representatives of the Turks and the Allied Powers. The terms were those previously agreed upon by Great Britain and France, and presented by General Harrington, the British representative, on behalf of the Allies. The armistice made the following provisions:

1. Greek evacuation of Eastern Thrace within fifteen days under supervision of Allied missions and troops, and transfer of civil control to Turkey within thirty days.

2. The Turks to be allowed 8,000 gendarmerie in Thrace (2,000 originally proposed by the Allies) to reinforce the civil authorities.

3. Allied missions and forces to be withdrawn within thirty days after the Greek evacuation.

4. New neutral zones of Allied occupation established in the Chanak and Ismid areas (the line running about fifteen kilometers from the coast of the Dardanelles and forty kilometers from the coast of the Bosphorus); and the Constantinople neutral zone to extend about thirty miles west of the Tchatalja line.

5. The western boundary of the Turkish possessions in Thrace to follow the Maritza river from its mouth to the Bulgarian boundary.

The Greek delegates refused to sign this agreement, but the fulfilment of its terms by Greece was guaranteed by the Allied powers. Greek military evacuation of Thrace began on October 15, and was accompanied by an exodus of a large part of the 500,000 Greek population.

DETAILS OF NEGOTIATIONS.—On September 29 the Turkish National Assembly replied favorably to the Allied joint Note of September 23, and in accordance with this note the armistice conference met at Mudania on October 3, with military representatives of Great Britain, France, Italy, Greece, and the Turkish Nationalists.

The Turkish demands presented by General Ismet Pasha and calling for evacuation of Thrace within eight days were declared unacceptable.

After a rupture on October 5, the conference met again on October 7, with a more conciliatory attitude on the part of the Turks.

In the meantime Foreign Minister Curzon and M. Poincaré met in Paris and reached an agreement upon the terms which were subsequently accepted. After submission to the Turkish Assembly, these terms were approved and embodied in an armistice agreement as stated above.

NEAR EAST PEACE CONFERENCE.—In accordance with the Allied joint Note of September 23, accepted by the Turks, a peace conference was to follow the Mudania armistice. The date of this conference was later set for November 20, and Lausanne, Switzerland approved as the meeting place. The idea of a preliminary Allied conference to settle upon financial and economic terms for Turkey was abandoned.

NEW RÉGIME IN GREECE.—Following the abdication of Constantine of Greece and the accession to the throne of his son George, former Premier Venizelos accepted the duty of special Greek ambassador in foreign capitals, though he refused to return to Athens and resume a leading rôle in Greek politics. M. Politis, who served as Foreign Minister under Venizelos, accepted this office in the new government. Parliamentary elections were set for November 13. The British, Belgian, Italian, and other diplomatic representatives at once visited the palace, indicating a favorable attitude toward the governmental change.

GREAT BRITAIN

CHANGE OF MINISTRY.—A meeting of Conservative members of parliament at Carlton House, London, on October 19, decided by a vote of 187 to 87 to enter the next elections as a separate party with its own leader and program. This decision ended the Liberal-Conservative coalition which had supported the Lloyd George Ministry since 1916. It was made against the opposition of Mr. Austin Chamberlain, Lord Balfour, and other leaders of the independent wing of the party, who argued that separation of the older parties would throw the government ultimately into the hands of the Labor Party. On the other hand Mr. Bonar Law and other Conservatives held that Premier Lloyd George had lost the confidence of the country, and that it was more important for the Conservative party to stand together on its own platform, than to win the election by a coalition.

On October 19 Mr. Lloyd George called on the King to present the resignation of his cabinet. Mr. Bonar Law was requested to form a new ministry with assurance of the continuance of Lord Curzon as Minister of Foreign Affairs. The new premier asked the king to dissolve parliament and call for elections on November 13.

THE LLOYD GEORGE MINISTRY.—Of the four premier statesmen who conducted the World War to a successful termination in the autumn of 1918 and, in the new year, convened at the Paris Peace Conference as the "Big Four," David Lloyd George is the last to retire. The first was

Signor Orlando of Italy, who was defeated at Montecitorio in the following June on account of his failure to have his Government's views prevail at the conference. Clemenceau, after having signed the principal treaties of peace retired from office in January, 1920. In the following March the United States Senate failed to ratify the treaties negotiated by President Wilson at Paris and in November his party was defeated in the National election.

All the four allied and associated nations indicated, with the exception of the United States, had conducted the war by means of coalition governments which, beginning after the outbreak of hostilities, by collections of the most eminent men, whatever their politics, changed as the exigiencies of political and military affairs demanded, from political coalition ministries of multiple portfolios to war cabinets of greater centralized power at home and greater prestige, if not authority, abroad.

At the beginning of December, 1916, principally owing to the attacks of the *Northcliffe* press, it had become a public conviction in the United Kingdom that the Asquith Government in which Lloyd George had been successively Chancellor of the Exchequer, and as such had prepared the first war budget of November, 1914, and then as Minister of Munitions, when the first coalition was formed in May, 1915, was not conducting the war as intensively as the circumstances warranted. Lloyd George writing to the Prime Minister threatened to resign unless the conduct of the war should be placed in the hands of the committee of four which did not include Mr. Asquith. Mr. Asquith declined and so the ministry was formed under Lloyd George with Bonar Law as his partner. The Government so formed had not only the support of those Unionists and nearly all those Liberals who had been supporting the Asquith Government, but also of the Labor Party.

Although Lloyd George had continued to advocate a neutral policy for the Government while Sir Edward Grey, as the British Foreign Minister, was attempting to prevent the great war in the last days of July, 1914, nevertheless, he had at the time of the Agadir crisis in July, 1911, made an eloquent speech in defense of the empire, and when a British declaration of war became inevitable owing to Germany's invasion of Belgium, he had at once begun, as Chancellor of the Exchequer, to conduct British finances in a masterly manner. Later as Minister of Munitions he had gained public confidence quite as much by his speeches as by his actions.

Prior to December, 1916, the Cabinet had consisted of the political chiefs of the principal Government departments, exceeding twenty in number. With the formation of the Lloyd George Government the Cabinet was reduced to six. This was the Cabinet which became known as the "War Cabinet," and, as occasion required, was expanded into the "Imperial War Cabinet" by the inclusion of the Colonial Prime Ministers and other representatives of the various parts of the empire. The powers of this Cabinet had so expanded that in July, 1918, just at the time of the beginning of the Foch counter-offensive, each Dominion Prime Minister had the right to nominate a Cabinet Minister, either as resident or visitor, to represent him at the meetings held between the plenary sessions. From about the same date began the assembly of the political heads of departments known as the "Standing Committee of Home Affairs," which dealt with internal policy alone. This committee, together with the original "War Cabinet," was dissolved in October, 1919, and a full Cabinet of about twenty members was re-established.

A general election was held on December 14, 1918, with the result that, while seventy-three Sinn Feiners had been electd, who declined to take their seats, the Government, in spite of the deflections of the Labor Party, which henceforth were to become more pronounced, was able to control

471 votes in the Commons out of a total of 707.—*New York Times,* October, 1922.

PROCEEDINGS OF IRISH PARLIAMENT.—The Irish Parliament on October 3 proclaimed amnesty to political offenders to extend until October 15. As no advantage of this offer was taken by the opposition, military operations were resumed more actively after that date.

In parliamentary committee, progress on the draft of the new Irish Constitution proceeded with little difficulty and it was regarded as certain of adoption without noteworthy change. Art. XVII, containing the much-discussed oath for members of parliament, was approved by a large majority.

UNITED STATES

CANADA TO NEGOTIATE FRONTIER TREATY.—*Washington, October 16.* In recognition of Canada's particular interest in maintenance of amicable relations with the United States, the British Government has decided to authorize the Canadians to negotiate directly with the American State Department in the framing of the new treaty to regulate naval strength on the Great Lakes. In the near future a representative of the Canadian Government is expected in Washington to begin these negotiations, the foundations for which were laid during the visit here last July of Premier McKenzie King.

The matter of naval vessels on the lakes will probably be only one of several subjects covered by the new treaty, which is now expected to supplant entirely the treaty of 1817. It is understood that there is no disposition on either side to increase naval armament on the lakes beyond the needs of militia training and customs law enforcement, but it is probable an effort will be made to define zones in the lakes wherein customs and militia vessels may operate lawfully even where purely territorial waters are involved.—*New York Times,* 17 October, 1922.

NO EXTENSION OF THREE-MILE LIMIT.—*Washington, October 16.* The British Government today rejected the American Government's proposal for a treaty between the two nations under which the authorities of each would be authorized to exercise beyond the three-mile limit of territorial water the right of search for the purpose of preventing the smuggling of liquor into the United States.

The proposal for such a treaty was submitted by Secretary Hughes on June 26, in a note to the British Ambassador, Sir Auckland Geddes, seeking co-operation between the British and American Governments against persons engaged in illicit liquor trade from the Bahamas and other British possessions in violation of American constitutional and statutory provisions.

The outstanding feature of the treaty was a reciprocal provision authorizing each Government to exercise a right of search of vessels of the other beyond the three-mile limit of territorial waters to the extent of twelve miles from the shore.

Great Britain's refusal to acquiesce in the proposal treaty is based on the time-honored principle under which the British Government has opposed the search in time of peace of British vessels anywhere on the high seas outside the three-mile limit. The note delivered by Ambassador Geddes to Secretary Hughes asserts that Great Britain has always consistently opposed any extension of the three-mile limit and cannot "properly acquiesce in order to meet a temporary emergency in the

abandonment of a principle to which they attach great importance."—*New York Times,* 17 August, 1922.

HAGUE COURT DECISION AGAINST UNITED STATES.—On October 13 the Hague Court of Arbitration announced the award to Norway of $12,000,000 for ships requisitioned by the United States in the World War. Norway had presented claims for $13,000,000 plus interest, and the United States had recognized liability for $2,500,000.

Although the convention establishing the Hague Court does not provide for protest of its decisions, the United States arbitrator, Chandler P. Anderson, absented himself when the decision was announced and sent a letter declaring that the court had disregarded the terms of submission and exceeded the authority conferred by the special agreement of June 30.

The last similar instance of protest was by a Japanese twenty years ago.

GERMANY

FURTHER REPARATION DISCUSSIONS.—The British plan for further adjustment of the reparation problem, as presented by Sir John Bradbury to the Reparation Commission in October, was in general terms a five-year moratorium for Germany. On the other hand, a French Memorandum presented on October 10, proposed: (1) Complete and rigid control of German finances by the creditor nations, including power to veto expenditures, regulate taxation, and dictate the arrangement of the budgets of the various German states; (2) limitation of the power of the Reparation Commission to the application of new guarantees and reforms, leaving the settlement of more comprehensive issues to an international conference. It was the French view that this should be the business of the proposed Brussels Conference in December.

PRESIDENT EBERT'S TERM EXTENDED.—In the middle of October the Reichstag passed a measure altering the Constitution so as to extend President Ebert's term of office until 1926. Herr Ebert was elected provisional president by the Weimar National Assembly in 1919, pending a regular election. The extension was decided upon in order to avoid the dangers and difficulties of a popular election at the present time.

LIMITATION OF ARMAMENTS.—*Geneva, September 28.* After spending two years in laying foundations, the League of Nations has now faced squarely up to the problem of disarmament. It was perhaps inevitable that the early stages of the work should show disappointingly slow progress, but the vigor Lord Robert Cecil managed to infuse into the commission concerned, as soon as he became a member of it, suggests that if he had been there sooner the commission might have moved a little faster.

However that may be, it has moved well in the past three months, and with its scheme definitely approved by the League Assembly, the nations of Europe, and some other nations, too, have now to say yes or no to a practical proposition, the acceptance of which would to all appearance bring to the overburdened citizens of every country the first hope of relief they could clutch at since the Armistice.

So long as nations believe that they have no means of security but force, they will clearly not reduce the force they command while dangers manifestly impend. Poland, Rumania, Jugo-Slavia, Czecho-Slovakia would and could return no other answer than that to the proposals of the armament reducers. But if another security could be substituted for the security conferred by a state's own national army the case might be altogether different. That has been recognized by Lord Robert and made the basis of his scheme.

If one state in isolation cannot reduce its army, a number of states in combination may well be strong enough to protect one another against any threatened aggression. But the number of states so binding themselves in a defensive guarantee must be large enough. It may well be doubted, for example, whether the four states mentioned above would feel that even with the completest understanding between themselves, they could reduce their armies while the intentions of Russia are unknown. If, on the other hand, they had behind them France, and Italy, and Britain, and Holland, and Spain, and Belgium, then a new situation would be created and practically every state of Europe could reduce its forces to something below their present level.

That is the scheme the League of Nations Assembly has approved, and matters have gone so far that a competent commission has been instructed to prepare a draft treaty embodying these principles in the form of obligations which the several nations can thereupon be invited to accept.

But the League is pushing forward on other lines at the same time. In deciding to convene at Geneva next May (the date was chosen so as to fall after the Pan-American Congress), a naval conference, to which all states shall be invited, the League ranges itself directly in line with the organizers of the Washington parley and the authors of the pacts there concluded. It is a matter for satisfaction that Brazil, which at first took exception to this proposal, has withdrawn its obections and declared its intention of attending the conference.

Finally, one more endeavor is being made to overcome the obstacles placed in the way of a limitation of instruments of war by the decision of the United States Government not to ratify the Arms Traffic Convention of St. Germain.

The League is calling a further conference to deal with these problems, and encouraged by the declaration of the United States Government that, though it will not ratify the St. Germain convention, it cordially approves the objects the convention has in view; it intends to invite the United States both to state its objections to the convention and to be represented at the conference.—*Baltimore Sun,* 14 August, 1922.

RELIEF FOR AUSTRIA.—*Geneva, October 4* (Associated Press)—Ignaz Seipel, the Austrian Chancellor, and the representatives of Great Britain, France and Italy this afternoon signed the protocol making effective the plan of the League of Nations to save Austria.

The protocol consists of three documents. The first is a declaration by Great Britain, France, Italy and Czecho-Slovakia, the principal guarantors of the loan which will be made to Austria, that they will respect the territorial integrity, independence and sovereignty of Austria and will seek no special or exclusive financial or economic advantages that would compromise Austria's independence.

The other two documents authorize Austria to issue for sale bonds sufficient to produce the equivalent of a maximum of 650,000,000 gold crowns, and provide for the guarantee of interest on the sinking fund by Great Britain, France, Italy and Czecho-Slovakia of eighty per cent of that sum. Austria pledges for the payment of the interest on the bonds her

customs receipts and the tobacco monopoly, and agrees to undertake reforms necessary to balance her budget.

The Austrian Government accepts supervision in the application of reforms by a Commissioner of the League of Nations, whose authorization will be necessary before the Austrian Treasury proceeds to realize on loans guaranteed by the powers. It abandons all rights to issue paper money or negotiate loans, and accepts supervision by a commission composed of representatives of each nation guaranteeing a portion of the loan.

FRANCE

RUSSIAN RAPPROCHEMENT WITH FRANCE.—As a result of divergence between Great Britain and France, especially over German reparations and Near East problems, French political sentiment has shown a tendency to revive the old understanding with Russia, in spite of the difference between Soviet Russia and the Russia before the war. Indication of this trend of political alignment was the importance attached to the visit to Russia of M. Herriot, the President of the French Radical Socialist Party. M. Herriot declared the Russians were willing to recognize the Russian debt to France, and that thus the chief barrier to an understanding was removed.

FAR EAST

JAPANESE EVACUATION OF VLADIVOSTOK.—Japanese evacuation of troops from the Vladivostok district began on October 6, and was completed on October 26. With the withdrawal of the Japanese, the "white" government in Vladivostok under General Dieterichs was exposed to overthrow by "red" forces of the Far Eastern Republic which closed in on the city. American and British marines were landed on October 20 to protect foreign lives and property.

REVIEW OF BOOKS

INTERNATIONAL RELATIONS, by James Bryce. (The Macmillan Company, New York. $2.50) A Review by Rear Admiral Caspar F. Goodrich, U. S. N.

This is the swan song of one of the greatest authorities on the subject defined in the title of a rarely fascinating and interesting book. Not only did Lord Bryce know his topic from the dawn of history to the present day, but he could talk of it gracefully and engagingly as well. These pages are the reproduction in print of lectures delivered during the summer of 1921, at the annual conference on international affairs held at Williamstown, Mass.; for force and attractiveness they lack nothing but the voice and charm of the speaker, now gone from us forever.

Lord Bryce asked why it is that jealousy, suspicion, envy and hatred persist in the intercourse between states, even between those recently drawn together by a great and common danger; and what can be done to make war less frequent and peace more prolonged. As ought have been expected from the author of the *Holy Roman Empire,* he seeks in history the reasons for the discord which but too generally prevails, and for suggestions of methods through which this discord may be replaced by mutual understanding and co-operation.

In his first lecture, Bryce goes back to the earliest times when every man was independent of all others, living by the spoils of the chase, taking from his neighbor what he liked, if he could, and defending his own against aggressors. This delightfully simple condition of life was known to the ancient philosophers as the "State of Nature." As men found it expedient to form associations of their kin for purposes of offense and defense, there came into being clans, tribes, and nations, each marked by the sacrifice of individual freedom of action in return for protection by the community as a whole. At every step, however, the clans, the tribes or the nations are seen to be in the "State of Nature" to each other and this is true today. "Although in civilized countries every individual is now under law and not in a State of Nature towards his fellow men, every political community, whatever its form, be it republican or monarchical, is in a State of Nature towards every other community."

There is no extraneous power which can dictate to a nation the course it should pursue under certain circumstances, still less enforce a keeping of the peace. Even so mild a philosopher as the author has tacitly but not explicitly to recognize the fundamental fact that the judgments of

courts, civil and criminal, find acceptance, not because of an enlightened public opinion, but because back of them are arrayed the local police, the state militia, and finally the full armed strength of the entire land. In effect, justice is based on force and not, as the Stoics would have it, upon man's having attained his true nature with his passions subdued by reason, as in the mythical Golden Age, so often lauded by the dreamer or the revolutionist, and never actually achieved. Facing this grim truth, that every political community stands in a State of Nature toward all others, there must either be erected some authority above them all or there must be an improvement, not so much in human nature itself, as in a change of peoples' attitude toward foreign relations, through making them realize that they will gain more by co-operation than by conflict.

The author's study of the causes of the Great War describes the nervous tension under which all the European chancelleries labored, due to the fateful seizure of Alsace and Lorraine in 1871, to the constant growth of armaments, and to the anxieties the latter aroused on each side of the frontiers of adjoining states; but it seems to lay insufficient stress on the openly avowed purpose of Germany to establish world dominion.

With the treaties negotiated at Paris, he is thoroughly dissatisfied, as well he might be, since they have created new states without any sound basis in race for the determination of their boundaries. The particulars in which these treaties err are worthy of deep consideration, fraught as they are with terrible possibilities. He says, "Why the Turkish Government, which had in 1915 massacred a million of its Christian subjects, women as well as men, under circumstances of brutality and cruelty unsurpassed in the history of even the blood-stained East . . . . should have been treated by the Allies with such extraordinary lenity and should now have fresh indulgences offered to it by the proposed modifications in the Treaty of Sevres—these are mysteries, the explanation whereof is probably known to some of you as it is to me. But the secret is one which . . . . is too sacred for me to mention." This quotation will give an idea of Bryce's general attitude towards the bungling work done in Paris in 1919. He sounds a note of warning that a better peace must be secured "by removing the dangers and injustices which bode future wars." "Legally," he says, "there is peace; but temperamentally there is war." Still, it must be said that some of the causes of earlier wars have disappeared since Hapsburgs, Hohenzollerns, and other dynasties have ceased to control foreign relations, and nations no longer foster enmity along religious lines, although among Asiatics this sentiment has not lost all its potency for evil as recent events demonstrate. The discussion in his chapter on the Causes Making for War or Peace deserves careful reading, however lacking it may be in encouragement for the future.

Naturally, Bryce cherished the hope that a healthy public opinion might, through straight-forward diplomacy, give to International Law the power which is denied it by the absence of force, and he sought ways and means to bring about this much to be desired result. This hope, it may be recalled is, or was, shared by our own Mr. Root. Its validity is unchal-

lenged insofar as peoples are concerned whose speech and traditions are identical, but, with those of different tongues and different modes of thought, this validity remains a thing to be hoped for rather than expected.

The lecture on the Morality of States is most illuminating if somewhat depressing. One might almost say that a state has no morals at all. At least history proves that selfish interest has led to most abominable assaults on the coveted territory of neighbors. The story of Naboth's vineyard is reproduced on tribal or national lines throughout the ages, our own not excepted. Bryce attributes this lack of morality to the absence of that responsibility between states which exists among individuals who live under the reign of law. "Few men avow, and of course nearly all moralists condemn, the doctrine that the end justifies the means. But it is widely followed in public life, and oddly enough, those who think themselves idealists, the men who live and fight for the thing, whatever it may be, that they put above everything else, and call a Sacred Cause, frequently apply this insidious doctrine." For this reason, Bryce deprecates the entrance into diplomatic discussions of the whole body corporate. What it desires must, of course, guide its representatives, but the negotiations are better left to the latter, who act in its name and then present the results to it for ratification or rejection.

The author believed in conferences. In this respect he resembles the late Marquis of Salisbury who is said to have remarked, "There's no question which cannot be settled by four men sitting around a table." Putting aside the erecting of an international police force as a practical impossibility, there is indeed no other way open to the bringing about of a better understanding between sovereign powers. The road bristles with difficulties as the conduct of Germany amply demonstrated at the Hague. Still, patience and renewed efforts may be counted upon to effect substantial progress. The creation of a Court of Arbitration was followed by results of encouraging promise, while what was done by the recent Washington Conference bodes well, however short it fell of the desired maximum.

Wisely, it seems to me, Bryce rejects the proposition of a World Federation for the excellent reason that each member would have either an equal voice in the management or one based on population. In the latter case, the Western World would be swamped by China, or by a combination of states of which the citizens would be illiterate, or moved by the savage impulse of ignorance. Whether Bryce condemned the League of Nations, he does not state in positive terms but the inference is inescapable that it found no favor in his eyes, as one reads his analysis of a possible Combination of Powers. We must all agree with him, for such is our own attitude, as shown in countless instances, when he says, "Every civilized nation, since its fortunes are inextricably involved with the good or evil fortunes of every other, is bound for its own sake to an interest in the well-being of others and to help them, in whatever way

it finds best, to avoid or recover from disasters. The greatest disaster is war, more terrible in its consequences than earthquakes in Sicily, or famines in China." It behooves us therefore to do all in our power to persuade other nations to seek a solution of their quarrels without resort to arms for the very good reason that, if they do not, upon us will fall a repetition of our present experience of having to help them escape from or to bear the burdens resulting from their unrestrained bellicose propensities.

There can be no doubt that a deeper sympathy with foreigners and a wider understanding of their problems, such as Bryce advocates, would go far to aid in the maintenance of peace, but we are quite within our rights when we condition our assistance upon the real, not the merely verbally expressed acceptance of the obligations on their part to cultivate the like charity. We hold the financial whip and we should not hesitate to crack it when we see a government spending its revenue on armies while its people starve. This reflection is mine, not Bryce's, I need hardly say. For all this brilliant ratiocination, I cannot conscientiously recommend a lack of military preparedness, which has, time and time again, cost us heavily in every way. We may counsel arbitration and practice it whenever we can, but until all nations accept it loyally, our advice is likely to have weight only if we have more than mere words to back it.

The book under review is as fascinating as a best seller. It brings before the eye a panorama of human life from the days of the cave man through those of Greece and Rome and the Middle Ages, down to the present. It revives our long forgotten school lessons and puts into history a vitality which as boys, and indeed as men, we never suspected. I urge my brother officers to read it, confident that when they do, they will thank me for having brought it to their notice.

NAVAL OPERATIONS, Vol. II. Text and Maps. By Sir Julian S. Corbett, Longmans, Green & Co. Price $7.50. 1921. A Review by Rear Admiral Albert Gleaves, U. S. Navy.

More than half of the second volume of the Naval Operations Series is devoted to the Dardanelles Operations, from the inception of that mad adventure in January, 1915, to the beginning of the campaign as it was carried on by the Army under Sir Ian Hamilton.

The period covered by this big book of nearly 500 pages is the half year following the Falkland Islands action. It includes principally the loss of the *Formidable,* the Yorkshire raid, the Dogger Bank battle, the progress of the *U*-boat campaign and the loss of the *Lusitania.* The volume ends with the resignation of Lord Fisher and Mr. Churchill, and the formation of the Coalition Cabinet. In the discussion of the British blockade and the German war zone, a fair statement of the American protest is presented. It will be recalled that there was much irritation in this country over British detention of certain American ships and

American mail. These questions, the author states, "were settled out of court." This subject will be referred to later in this article.

The book is as interesting as a novel, which as some one has said is to compliment the novel. The author never indulges in superlatives, and rarely in adjectives, but at times his admiration of the British Navy and its splendid work leads him away from cold and formal narrative to something like enthusiasm. For instance in describing the loss of the *Formidable,* he says, "—of Captain Loxley nothing more was seen. Survivors saw him standing with his terrier on the bridge till the last, giving his orders as coolly as though the ship were going in harbor, cheering and steadying the men, praising the officers for every smart piece of work, and his reward was to see perfect discipline and alacrity maintained to the end." Again in telling of the night boat expedition which succeeded in destroying the *E-15* which had grounded under one of the forts in the Dardanelles, he says, "—it was a gallant feat, finely executed and one which it is pleasant to know extorted high praise from the enemy," and quotes a German officer in Constantinople as saying when referring to it, "I take off my hat to the British Navy."

As the subjects treated in this volume have begotten libraries of discussion and recriminations, the author again reminds his readers that although the Admiralty has placed the official documents at his disposal he alone is responsible for the opinions expressed. He emphatically denies that anything in the nature of censorship has been exercised by the Admiralty.

After the destruction of Admiral Von Spee's squadron at the Falklands, a redistribution of the home fleets was effected, and the war entered a new phase. The *Dresden* had not been captured, the mystery of the *Karlsruhe* was not solved and two big armed merchant liners, the *Prinz Eitel-Friedrich* and the *Kronz Prinz Wilhelm,* were still at large on the high seas on the southern and western trade routes; therefore in the Western Atlantic there was no let-up in vigilance on the part of the British cruisers.

When the news of Sturdee's victory was received in London, it was natural to believe that the Germans would take advantage of the reduced force of the Grand Fleet to make a descent somewhere on the East Coast of England. It was Admiral Jellicoe's problem to estimate the situation, anticipate the raid and to decide upon the most probable point of attack. That the Germans were preparing to come out was known at the Admiralty.

It appears that the disposition of the forces was made by the Admiralty, although the rendezvous, "a matter of no less difficulty than importance," was left to the commander-in-chief.

On the part of the Germans, there can be no doubt that their intention was to give an exhibition of Teutonic frightfulness, and to strike such fear into the hearts of the enemy that recruiting would be paralyzed.

The High Seas Fleet had been held inside the Bight ever since the

Heligoland action by personal orders of the Kaiser, and it was only on the initiative of Admiral Von Ingenohl that the three battle squadrons were sent out to support the raiding force, which was under the command of Admiral Von Hipper, and was composed of the four battle cruisers, the heavy cruiser *Blucher,* and the second Scouting Division of light cruisers and destroyers. The raiders sailed from Cuxhaven to the rendezvous December 15, in the afternoon, and after dark they proceeded on their mission, followed by the battle squadron.

Unopposed they passed through the twenty-mile gap in the mine fields which they had planted off the English coast and at 8:00 the next morning, having divided the force, Von Hipper began the bombardment simultaneously of Hartlepool and Scarborough, the *Seydlitz, Moltke* and *Blucher* off Hartlepool and the *Derfflinger, Von der Tann* and *Kolberg* off Scarborough. The last named port was undefended, but Hartlepool had a battery of 6-inch guns and was also a flotilla station. The firing lasted about a half hour. Little military damage was done, but eighty-six people on shore were killed and over 400 wounded. Von Hipper then reunited his forces and started back home.

The rendezvous appointed by Admiral Jellicoe was twenty-five miles south east of the S. W. patch or horn of Dogger Bank and roughly halfway between Flamborough Head and Heligoland. The English destroyers made contact with the German destroyer screen about 5:00 A. M. but the presence of the English destroyers was known to Admiral Von Ingenohl an hour earlier. Obsessed with the fear of losses of his heavy ships by torpedo attacks, and burdened by his peremptory orders not to risk them except under favorable circumstances, and evidently forgetting that ships were made to take risks in battle, he deliberately abandoned the raiding forces which were well over on the English coast, and to use Sir Julian's words "fairly turned tail and made for home."

The day dawned clear, and began with a smooth sea. But a N. W. wind increasing to gale force soon sprang up, the visibility decreased, and the seas became short and steep, making it difficult for the destroyers. Although neither side knew it, at 6 A. M. G. M. T. the two main fleets were only about fifty miles apart, but they were destined not to meet that day.

While Admiral Warrender, who was the Senior Officer, and Admiral Beatty were trying to locate the enemy in the vicinity of Dogger Bank, the German squadrons had already reached the English coast. It was not until 9:30 that the English Admirals received a radio from the Admiralty that the raid had been accomplished; it was now their problem to intercept and destroy the raiders on their return to base.

Favored by the thick weather, Von Hipper made an easy run of it. First he steered a little north of east until after 12 noon, then he ran a few miles S. E., then turned to the N. N. E. for about twenty-five miles northward of Dogger Bank, and so back to the Bight. The official chart shows the English ships clustered around the Bank, and the unobstructed homeward track of the raiders well clear of them.

Sir Julian comments thus: "Two of the most efficient and powerful British Squadrons with an adequate force of scouting vessels knowing approximately what to expect and operating in an area strictly limited by the possibilities of the situation, had failed to bring to action an enemy who was operating in close conformity with our appreciation and with whose advanced screen contact had been established."

Admiral Beatty was ordered to discontinue the chase at 3:47. In this affair the submarines were stationed off Terschelling by order of the Admiralty, but took no part in the action except one torpedo fired from the *E-11* which missed.

The Germans were bitterly disappointed. Von Tirpitz said that, "Ingenohl had the fate of Germany in the palm of his hand. I boil with inward emotion whenever I think of it." Von Schèer says, "It is extremely probable that by continuing in our original direction the two courses would have crossed within sight of each other during the morning." The author says, "In all the war there is no action which gives deeper cause for reflection on the conduct of operations at sea. On our own side the disappointment was profound." Bellairs, always a severe critic of the Grand Fleet, writes, "—does it never occur to the mechanical, (school) which wants war to be all certainties, that the sea belongs to the most skillful and artful wooer who adapts himself to her variable moods."

The battle of Dogger Bank on January 24, 1915, was a battle of battle cruisers and destroyers. The story as told by Sir Julian, which differs in some respects from some other writers* as well as from the official report as given out by the Admiralty soon after the fight, must be accepted as authoritative.

The action was brought about by an early morning collision between the advance screen of Von Hipper standing to the N. W. and that of Admiral Beatty steaming S. E. Whether the German Admiral was bound out for a northern raid, or whether he was making a reconnaissance, or whether the German sortie was a diversion to facilitate an invasion (which some Dutch critics thought) is immaterial. The reappearance of the German ships in the North Sea was not unexpected and Jellicoe was looking for them. At the time Beatty sighted them, they had turned to the southward toward their base. Jellicoe with the battle squadron from Scapa was coming down from the North and at 8 A. M. was 150 miles from the scene of action. There seemed to be a chance for a decisive engagement.

NOTE: H. C. O'Neill, *A History of the War*. London. T. C. and E. C. Tach. 1920.

Filson Young's brilliant account is that of an eye witness on board Admiral Beatty's Flagship the *Lion*. See "With the Battle Cruisers." Mr. Young's track charts differ from Sir Julian Corbett's. As a rule, however, track charts of ships during a battle are not to be taken too seriously.

The *Lion,* Flagship of Admiral Beatty, sighted gun flashes at 7:20 A. M. bearing S. S. E. The English ships were in column ahead, the *Lion, Tiger, Princess Royal, New Zealand* and *Indomitable.* At 7:50 Beatty made out the German battle cruisers on his port bow fourteen miles distant. He began working up speed to 28 knots, and steered a course parallel to the enemy, and clear of his wake in order to avoid mines. Just before 9 o'clock Beatty tried a ranging shot at 20,000 yards and shortly afterwards all the English vessels opened fire on the German sternmost ship, the *Blucher.* For the next two hours there raged a battle which will always hold a unique place in the history of sea warfare on account of a series of untoward occurrences by which a superior force not only failed to score a decisive victory, but enabled a crippled enemy to escape at the moment when his defeat seemed to be a question of only a few mintues. At 9:25 the great speed of the English had brought them close enough to engage opposite numbers. The *Tiger* did not understand the signal to do this and continued to fire on the German leader with the *Lion.* As the *Princess Royal* had shifted to the third German ship, the *Moltke,* the second German ship, the *Derfflinger,* was not under fire at all, and as the Germans adhered to their doctrine of concentration of fire on the van, the *Lion* was not only under her fierce and undisturbed fire but of that also of the *Seydlitz, Moltke* and the *Blucher.*

It is to be noted that the English being to the leeward were getting the German destroyer smoke, and for a time Beatty lost sight of the enemy. Fearing a torpedo attack the English turned away two points at 9:40. A few minutes later the *Lion* began to be heavily hit, and about the same time the *Blucher*, which had severely suffered, dropped astern on fire, disabled but fighting gallantly until she sank at 12:13. At 10:54 submarines were reported on the starboard bow, and Beatty turned his ships eight points to port, away from the danger *which was forward of his beam,* and incidentally across the wake of the fleeing enemy, then at 11:2 back again to N. E. to avoid mines. At this time, however, the *Lion* was struck a blow that put her out of action, for her speed was knocked down to 15 knots and she was forced to drop out. Just before this happened Beatty, whose wireless was out of commission, and all but two of his signal halyards shot away, had hoisted the signal N. E. and then "Keep nearer the enemy," a signal Nelson made at Trafalgar. When the *Lion* left the formation, the command automatically devolved upon the second in command. Beatty had made N. E. but this was not hauled down when he made "Attack the enemy's rear." The flags were end on, and the "Keep closer to the enemy" signal was not made out, and Admiral Moore interpreted the signal to mean "Attack enemy's rear bearing N. E." and proceeded with all the ships to attack the helpless *Blucher.* Von Hipper continued his flight unpursued.

The failure to get the signals to keep closer to the enemy, and the misinterpretation of the signal which did get through, cost the English the battle. Sir Julian Corbett refrains from criticism; perhaps he realized the uselessness of indulging in that world-old game of what-might-have

been. He likewise drops the mantle of charity over the German failure, and says only their attempt was "timorous." Lord Sidmouth remarks "the Germans lost a great opportunity."* But so also did the English.

After the battle a controversy started over Admiral Beatty's despatch reporting the action, as given out by the Admiralty. The fact is only referred to here as a matter of history, although Corbett does not mention it.

According to Mr. Young, who was on board the Flagship and attached to Admiral Beatty's staff, the Admiral sent a brief telegram to the Admiralty, which as published stated that the presence of submarines necessitated the action being broken off. The actual sentence in the original despatch was, "in view of the unknown condition of the *Lion,* and the presence of enemy's submarines, Admiral Moore considered retirement desirable at noon, and gave orders accordingly." Referring to Admiral Beatty's detailed report in February, 1915, Mr. Young says, "After some time this was returned to him in proof by the Admiralty, seventeen out of the thirty paragraphs either altered or omitted altogether." In his book, the original despatch, and the despatch as made public, are printed. "In some vital matters, 'the reports' are essentially different."

The Dardanelles Campaign originated on January 2, 1915, in a request of the Grand Duke Nicholas to Lord Kitchener to relieve the growing pressure in the Caucasus by arranging for a diversion of the Turkish Army elsewhere. The next day Kitchener reported in the affirmative, and he suggested to Lord Fisher that the navy make a demonstration at the Dardanelles as there were no troops available.

A test bombardment had been made on the forts at the entrance of the Dardanelles in November, by a combined English and French Squadron, which served no purpose other than to give warning to the Turks what they might expect later, and consequently the defenses had been strengthened. The First Lord referred the question to Admiral Carden who had succeeded Admiral Milne in command of the naval forces in the Mediterranean, and he gave it as his opinion that the forts could not be "rushed" by the navy, but "might be *forced* by extended operations," and he submitted plans.

On January 28, in spite of the opposition of Lord Fisher, the War Council decided upon a naval attack, although the grave risks of failure were freely recognized.

The attack was made by the combined forces of Admiral Carden and Admiral Guépratte. Sir Julian says, "At 9:51 on the morning of February 19, the first shot heralded the opening of the unparalleled operations which were destined to attain such vast proportions, to consume so much heroism and tragic effort, and end with such a glorious failure."

It is well to pause here to consider the old question of forts versus ships. It has been truly said that if history teaches anything, it is that it doesn't teach. In modern times, the fort has invariably had the ad-

**Quarterly Review,* April, 1922, "The Naval War."

vantage over the ship. At Alexandria for instance, although the fleet drove the Egyptians out of the fortifications, Stone Pasha* told the writer of this review a few days after the bombardment, that he had inspected the forts within two days, and with the exception of guns disabled by direct hits, the batteries could easily have been made ready for action again in a day. This agrees with Lord Sidmouth's statement, "Trained gunners could easily have beaten off the fleet at Alexandria in spite of all the gross defects of the works attacked."

Anyone who has seen the effect of ship fire on the forts at Santiago and Port Arthur, and Tsingtau, will not wonder that Lord Fisher left the council room on January 28, and was only prevented from sending in his resignation by Lord Kitchener's personal appeal for him to remain.

To return now to the narrative of the fleet attacks. The *Cornwallis* and *Triumph* opened the first action at a range of 7,700 yards, and in a few minutes the *Suffren* engaged the Kum Kale on the Asiatic side at anchor. The Flagship about noon tried two ranging shots at the Helles Fort at a distance of 15,000 to 16,000 yards. In the afternoon the bombardment continued but at shorter ranges, and all the ships were under way. At 5:20 the "General Recall" was made and the ships withdrew. The day closed with promise of success and the bombardment was to have been resumed the following day.

Unfortunately bad weather set in and continued for a week; during this interval the Turks repaired damages and Carden decided that troops were necessary; it was easier to request than to obtain. Kitchener could not understand why the navy couldn't do what he expected of it, but he did fully understand the consequences of failure to break through. It is worth mentioning here that during the interval of waiting and discussion the sea planes could not be used, "A misfortune that seriously affected the success of the work."

On February 25, the ships renewed the attack. Four ships underway worked in pairs and closed to 3,000 yards firing on Helles and Orkanie on either side of the entrance. Four ships at anchor engaged the forts between Helles and Orkanie. By 3:00 P. M. the shore batteries were silenced and then trawlers began sweeping, while the fleet returned to the anchorage.

At 8:00 the following morning, the attack was resumed and continued without opposition until 3:00 P. M. when fire was opened by concealed batteries which the sea planes had not found. At 4:00 the "General Recall" was hoisted and the ships withdrew. No attempt to land a force was made, but wrecking parties were sent ashore to blow up the guns in the deserted forts on both sides. This work, gallantly performed, brought the V. C. to Lieutenant Commander E. G. Robinson of the *Triumph*.

Operations were halted for two days by bad weather. It was now evident that a landing must be effected to clear the shores of the increasing batteries. It was also realized that if the attempt to force the

*General Charles P. Stone, formerly U. S. Army.

passage was to be abandoned, now was the time when it could be done without too much loss of face, but just then seven battalions of sailors and marines sailed for Lemnos, and the navy continued to carry on until March 10. Long range firing was useless without accurate spotting and the air forces had not been as efficient in this work as was expected. It was obvious, therefore, that close action was necessary. Then the question was how to force the mine fields which were protected by mobile guns. After careful consideration of all the difficulties it was decided to force the Narrows.

On March 17, Admiral De Robeck relieved Admiral Carden, who had been ordered home, and on the eighteenth the attack was made, but it was repulsed. Three battleships were sunk, and three more practically put out of commission. The forts were terribly hammered and the morale of the garrisons suffered equally but the ships had to retire.

Sir Ian Hamilton, who had been selected to command the Army Expeditionary Force, reached Tenedos on the evening of the seventeenth, the eve of the attack, at the same time as the last division of the French troops under General d'Armande. Both generals were in time to witness the naval fight at the Narrows.

Bad weather prevented the renewal of the attack on the nineteenth, and before the weather moderated the plans were all changed. Thenceforth the campaign was to be a combined army and navy operation, and a new phase of activities was begun.

Three weeks after the attack on the Narrows the army began landing on the beach north of Gabe Tepe—to be precise, it was 3:30 A. M. on April 25, that the picket boats with the cutters in tow cast off from the ships and steamed toward the land, and a half hour before dawn the boats with muffled oars hauled in their painters and rowed to the beach where they were greeted by rifle and machine-gun fire. Landings were made the same day at five other places, and in twenty-four hours over 33,000 men were put ashore. Lord Sidmouth says, "—it was a splendid feat of arms rendered possible only by devoted gallantry and the infinitely valuable covering fire of the ships." But it was only a footing. "The commanding ridge of Sari Bair was never occupied," and Achi Baba peak, 591 feet high, as important to the success of the landing as 203 metre hill at Port Arthur or the Henrich Berg at Tsingtau was to the Japanese, "was still two miles from our (British) front when the final withdrawal took place."

In the beginning of this article mention was made of the annoyance caused by the British detention of our mails. During the Civil War a similar controversy arose between the two countries when their status was reversed. England was the neutral and the United States the belligerent. The story is related by John Murray Forbes in his *Letters and Recollections.* Writing in the summer of 1863, from the Rhine, I think, having just left London where he was one of the many noncommissioned envoys employed in our propaganda in England, he says:

"Among my London acquaintances was Mr. Edward Ellis, a member of Parliament himself, and, I think, with one or two sons also in that body. He was a friend and adherent of Palmerston, and having a pecuniary interest in land on this side was supposed to be very well posted about American affairs. It was just at the time the controversy was going on about the letterbag of a steamer: it had been seized with the vessel carrying a cargo of munitions of war, nominally to Mexico, but undoubtedly intended for the Texan rebels. The bag must have contained proof of this, but, being under the seals of the British Post Office, was claimed by the British minister as sacred, and the dispute was going on as to what should be done with it: the condemnation of the vessel and cargo, amounting to a very large sum, depending a great deal upon the result.

"I was dining at Mr. Ellis' and while we were standing before the fire waiting for dinner to be announced, two or three of the younger members of Parliament came in and announced the 'good news' that the letterbag had been given up without being opened and removed the danger of a rupture in the friendly relations between the United States and Great Britain. This was all very polite, Mr. Adams being present and, as usual silent. I could not help, however, saying a word to this effect: 'I am very glad you like the news, but I hope you will remember one thing; that you are making a precedent which in the long future *we* intend to follow. You are now ready to introduce all possible privileges for neutrals in the carrying trade, but in the long run Great Britain is at war ten years while we are likely to be one; and whatever precedent you set now, we shall hold you to'."*

Sir Julian Corbett gives an interesting account of the unsuccessful search for the *Dresden* in the forbidding waterways of Terra del Fuego and Patagonia, and her final destruction at Juan Fernandez. When Von Spee made his *sauve qui peut* signal at the Falklands on December 8, to his light cruisers, she succeeded in escaping to Punta Arenas where she arrived on the eleventh. For three months she eluded the British squadron, although at times they were close on her heels. The *Bristol* and *Glasgow* reached Sandy Point the day after she sailed, and they hurried out to the westward hoping to run her down. The *Inflexible* swept outside the Horn and cruised up the coast as far as 43° S. when she was recalled. Admiral Stoddard in the *Carnarvon* took the east coast of Patagonia and the *Cornwall* did Staten Islands, and the Horn itself. It was trying navigation in those bleak solitudes where the long ocean swells break tremendously on the outlying rocks, and where there are so many breakers, the sea in one place is called the Milky Way. Although it was the summer season, the weather was cold, thick and misty, while the rain and sleet and snow swept violently down from the innumerable glaciers which descended to the coast line.

*John Murray Forbes', *Letters and Recollections,* edited by his daughter, Sarah Forbes Hughes, Vol. II, p. 31.

While the dauntless Englishmen were exploring the inlets and bays of a coast, "one sight of which," writes Darwin, "is enough to make a landsman dream for a week about shipwrecks, peril and death," the *Dresden* was lying quietly in the little cove charted as Hewett's Bay at the southern end of Barbara Channel where she anchored December 14. The English ships came close at times, but did not discover her. A week later the *Carnarvon* anchored at the north entrance of the channel and the *Dresden* shifted to an even more secluded anchorage on the southern shore of Santa Inez Island, where she remained undisturbed until February 15. Again, later in the month, the Admiral was within fifty miles of the chase and his tireless ships were sweeping the waterways from Beagle Channel as far north as Last Hope Inlet, where the *Bristol* damaged her rudder on an uncharted shoal.

The British Consul at Punta Arenas had good reason to believe that the German Consul was sending supplies to the *Dresden* in two tenders, and he was fairly certain of her anchorage. But neither the Admiralty nor the Admiral was convinced, and his information was discredited.

On February 13, the *Dresden,* overhauled and repaired as well as possible, ran out into the open sea, and cruised 300 miles off Coronel, where she coaled from colliers at prearranged rendezvous and sank a British ship. On the eighth of March she was at last sighted by the *Kent* who gave chase, but lost her at nightfall. On the ninth the *Dresden* reached Juan de Fernandez, and five days later she was found by the *Glasgow* and *Kent* and was destroyed at her anchorage.

The disregard of Chili's neutrality by both belligerents is a feature of the *Dresden* case: the English by searching with hostile intent the inland territorial waters of Chili, and finally attacking an enemy in a Chilian harbor; the Germans by violating the twenty-four hour limit for refreshment, and using Chilian anchorages as a base. England's prompt and courteous reply to Chili's protest, and immediate offer of compensation for all damages, soothed Chili's wounded feelings. Germany, however, paid no attention to the protest for at least six months.

We might to our advantage take a leaf from England's book on this subject. When our officers have violated neutrality they have usually been punished, as for instance in the *Trent* affair, the cutting out of the *Florida,* and the capture of the *Blanche.* There is nothing to show that Captain Luce of the *Glasgow* was even reprimanded, he was probably, and properly so, promoted. At all events the friendly relations between England and Chili were not impaired, nor was Chili's sympathy with the Allies affected. Clearly international law is on the side of the biggest battleships.

The volume closes fitly with an appreciation of Lord Fisher. When he found himself thwarted and his advice and suggestions ignored he resigned his seat as First Sea Lord. Sir Julian says: "To the country at large he was the embodiment of the old fighting energy of the navy—the man to whom we owed the organization and the strategical disposition which rendered the German fleet impotent when the long expected struggle

began, and the all embracing combination against Admiral Von Spee which had given us our only decisive success at sea." Lord Fisher's second term at the Admiralty was not long when measured by months, but it covered a momentous period in the history of the Empire, and was long enough to impress upon the people the soundness of his faith, "War is great conceptions, and quick decisions."

THE 20TH CENTURY GUIDE FOR DIESEL OPERATORS, By Rosbloom & Sawley. Western Technical Book Co. Price $15. A Review by William H. Pashley, Lieutenant Commander, U. S. Navy.

This is a disappointing book for many reasons, such as its confused arrangement, its extremely bad English, its numerous incorrect statements and the fact that it was carelessly proof read, if at all.

The authors state in the Foreword that "all data has been carefully selected to suit the person engaged in the profession or for use in the study of Internal Combustion Engineering," and that "The primary object of this valuable addition to technical publications on the subject of Internal Combustion Machinery and such information as this book contains, is to instruct those interested in the prime mover in practical form." They further state in the preface that, "Neither time nor expense has been spared in an effort to make this work a success, and by success is meant; 'A world's Standard Book'." With the above objects in view it seems a pity that loose statements such as the following are found: "The mechanical efficiency is expressed as the ratio between the effective power of the engine as measured by a brake on the engine shaft"; "In most cases there are levers by which cams are operated"; "The methods of fuel injection is a subject which can be solved and ultimately will have to be considered"; "Arguments in favor of Solid Injection as opposed to Air Injection is merely a matter of opinion"; "All bodies are supposed to be composed of minute particles so small that they can scarcely be seen by a high powered microscope"; "While the trend appears to be toward the solid injection system, nevertheless, mechanical injection is prevalent." These and innumerable other statements of the same character are found throughout this book. It would certainly not be beneficial to a person's English education to be compelled to study this as a text book and it is certain that a technical man could not "wade through" it without mental nausea.

I will now take up each chapter briefly, and endeavor to show what is wrong with this proposed addition to technical literature.

Chapter I. is devoted to "Technical Terms," as applied to Diesel Machinery and in this chapter we find such paragraphs as these.

"Ratio of Expansion:

The Thermal efficiency at its maximum is due to the increased temperature when the engine is at its highest production. The accomplished

results in creating the full energy out of the working mediums, and the working substance."

"Laws of Thermodynamics:

In the conversion of heat into mechanical energy, one unit of heat is lost for every 778 foot pounds of energy obtained; and conversely, in the production of heat by mechanical means, one unit of heat is obtained from 778 pounds of energy expended. It is also known that it is impossible for a self-acting engine to convey heat from one body to another at a higher temperature without the aid of external assistance."

The student or operator learning the definition for Thermal Efficiency or the Laws of Thermodynamics from this chapter would be grossly misinformed. There are a few other paragraphs explaining a few terms found in Physics and Thermodynamics together with a dissertation on "Values of Liquid Fuels, Coal Tar, Oil Tar, Composition of Water, Composition of Sea Water," and how the sediment from the latter would encrust the water jacketing of Diesel Engines. Aside from the character of the information furnished one can hardly consider "Values of Liquid Fuels," "Composition of Water," and "Composition of Sea Water" as technical terms.

Chapter II is devoted to "Theory." From the title of the book one might expect that one would here find the theory on which the Diesel Engine was conceived, but such is not the case as the Authors apparently aim at "Theory" in general with which they incorporate a method of getting data from an indicator card, the precautions to be taken in using the Thompson Indicator and how to calculate H.P. from an indicator card. This is followed by definitions and explanations of the Carnot and Otto cycles which are much involved and considerably in error as illustrated by the statement that "In theory, internal combustion engines work on either the Carnot or the Otto cycle." After this comes "Heat and Combustion," followed bv "Some Facts on Combustible Substances," among which are found the definitions for velocity, specific gravity, BTU, specific heat, etc. This chapter is so hopelessly mixed up that it is hard to conceive of it getting into print.

Chapter III is entitled "Miscellaneous Formulas" and is well named being a mixture of geometrical, triginometrical and empirical formulae, some good and some bad, the indiscriminate use of which might lead the operator or student into serious difficulties.

Chapter IV, "Principles of Operation," starts with a discourse in very bad English on Standardization; and drifts into valve action, fuel injection, two-cycle, four-cycle and two-cycle double acting engines. Then the authors discourse on the cycle of operation of the Diesel Engine in which they incorporate many ideas not germane to the subject, drift into directions for starting an engine, precautions to take before starting, types of fuel valves, engine timing, and finish the chapter with some meager information on the strength of materials. The arrangement of this chapter

is hopelessly bad. A better title for it would be "Some Miscellaneous Facts on Diesel Engines."

Chapter V is entitled "Liquid Substances" and, strange to say, concerns liquids only, their characteristics, measurement, viscosity, etc. This is better written by far than any of the preceding chapters and contains numerous useful facts.

Chapter VI, "Questions and Answers on Diesel Engine Operation," starts out with thirty questions on Diesel Engines few of which can be answered from what has been given in the preceding chapters and few of which concern Engine Operation, for example: Q.1. "Give a brief definition of a Diesel Engine"; Q.2. "How is the Diesel Engine classified in regard to construction?"; Q.19. "Why is the Diesel Engine classified as a constant pressure engine?," etc. Many of the questions are so poorly worded that one has to read the answer before one can understand the question, for example, Q.29. "Explain the construction of Valve Attachment." Most of the information in the answers is fairly correct though there are such errors as this: Q.15. "How is a compressor constructed?" Ans. "In two or three stages between each of which the air is cooled by passing through a reservoir of water." Although the authors undoubtedly meant air coolers a student would probably visualize humidifiers between stages. The next set of questions in this chapter come under the heading "Causes and Effects in the Principle of Operation of Diesel Engines and Remedies," and the first two questions are, "What is the maximum Piston Travel per minute and R.P.M.?" and, "How should valves be set on Diesel Engines?" Here again most of the information furnished is fairly correct but in some cases not sufficient to properly answer the question, while in others the answer does not have anything to do with the question. Q.30. "If repeated breakage of crankshaft should occur how would you account for it?" Ans. "Repeated breakage of crank shaft of Diesel engine is likely due to unequal working in cylinders, causing shocks and undue impacts. A crank shaft usually breaks after the material has become crystallized, and when a break has occurred it may be taken for granted that more or less crystallization has taken place throughout the whole crank shaft material. The original can be nearly recovered by heat treatment, and the whole crankshaft should be so treated occasionally, at least whenever part is repaired by welding." This answer is an exceedingly poor one as more Diesel Shafts break due to synchronous torsional vibration than to any other cause. Also the advice to heat treat an entire shaft after welding a part of it is unique as the shaft, particularly a long one, would be so warped as to be unusable in the engine it was removed from. This chapter is brought to a close with some information on "Machinery Material" which is of questionable use and partially wrong. It would probably give the student some erroneous ideas, for example: Q.8. "What material is used for the manufacture of shafting?" Ans. "Cold rolled steel is very widely used on account of the ease and cheapness with which it can be rolled true to

shape and size." While this is true, would not the student be led to believe that crank shafts, connecting rods, wrist pins and the like were made of this class of material as no mention is made of them elsewhere? Q.18. "What effect will carbon have on steel?" Ans. "Carbon up to 1.25 per cent. increases the strength of *iron* and the increase is proportional to the carbon content." In this case the story is only half told. Why not tell what else the addition of carbon does to steel (not iron), and not leave one to imagine that all one has to do to get strength is to add carbon, which is decidedly wrong.

Chapter VII on "Fuel Feed and Ignition," sticks to the subject but does not cover it fully, as there are numerous fuel injection valves on the market which deserve attention in any work on Diesels, I mean such valves as are found on the M.A.N. 3,000 H.P. type, four-cycle engines, and others of up to date design.

Chapter VIII, "Principles of Construction," starts with a long argument on two-cycle versus four-cycle engines as advanced by various manufacturers, with no attempt by the authors to settle the question or venture any enlightening opinion. This is followed by a fair description of a double acting engine. Next follows a few paragraphs on "Effects of Internal and External Stresses" which is not very illuminating. On page 153 is shown a "typical piston." This really is a two-stage air compressor piston. This is followed by a good article on scavenging two-cycle engines, then a discussion of the "Methods Employed in Reserving Marine Diesel Engines," but only the sliding cam shaft type of reversal is considered. Next comes Aspinall's governor which is all right as far as it goes but there are other governors a student might meet in practice and the principles governing which he should know.

Chapter IX, "Auxiliary Machinery and Accessories," is not quite so bad as some of the other chapters as it gives some very good cuts of oil coolers, filters, etc. In this chapter, however, is a description of the Sperry Magnetic Clutch which starts out with the statement: "The Sperry type of Magnetic Coupling or Clutch has been used successfully on submersible craft for a number of years. It may well be considered a clutch arrangement of exceptional reliability," etc. The government tests of the Sperry Clutch were made under my supervision and it never was installed in a submersible. It certainly can not be considered as reliable. It is at the present time in the experimental stage as regards clutching arrangements for Diesel Engines, though it is quite successful for clutching two motors, or a turbine to a motor. Tests showed that the Sperry Clutch will not hold reliably through a critical speed such as experienced in the operating range of most Diesel Engines. Again in this chapter we find "reserve gears for marine engines" described as though ships were backed by reverse gears. No mention is made of the size of engines for which these gears are suitable and one would be led to believe that a three or four thousand H.P. marine plant used a reverse gear to reverse the direction of the propeller.

Chapter X, "Description of Diesel Engines" commences with a good description and good cuts of the Busch Sulzer Engines such as found in the pamphlets of that company. This is followed by general description of various engines and rather a flattering description of the Nelseco line of engines which sounds like "selling talk." Experience with the construction and operation of these engines would lead to anything but flattering comment.

Further along in this chapter, referring to the "Description of the Sperry Compound Engine," we find the following statement: "It is very ingenious in design and experiences with the first engines in coastwise service has demonstrated its suitability and economy equal to the best Diesels of same horsepower capacity." The authors apparently believe the Sperry Compound is "in coastwise service" and has "demonstrated its suitability and economy." Whereas the truth is that the Sperry Engine is still in the experimental stage and is not operating in any coastwise service. It is, to be sure, an engine of remarkable promise provided certain engineering problems are solved, but, so far, it is not a commercial engine. The description of the development of the Diesel Engine for U. S. Submarines is very poorly done and considerably in error.

The remaining chapters of the book can be briefly summarized as follows: Chapter XI, "Diesel Electric Propulsion," starts with an article by W. E. Thau of the Westinghouse Company, which is thoroughly good. In fact this article is one of the few good ones in this book: Chapter XII contains much good material and good illustrations but it is poorly put together like the chapter on "Description of Diesel Engines"; Chapter XIII on "Air Compressors" contains far too little information on this most important auxiliary for either operator or student; Chapter XIV does not give much useful information on pumps nor does it describe the various successful types of pumps in service; Chapter XV, "Batteries" has no place in a Diesel textbook. Batteries and other electrical apparatus should, in my opinion, be taken up in a book devoted to electricity and electrical apparatus.

The collection of the material for writing this book must have involved an enormous amount of work, and it is most disappointing to find such laboriously collected material mixed up with statements not supported by fact, and then put up in book form, and offered to a public eager to obtain the best information possible concerning this latest type of machine for the generation of power. This book as it stands fails utterly to accomplish the purpose of the authors as given in the Foreword and Preface as it is neither "a valuable addition to technical publications" nor is it "A World's Standard Book."

ELECTRIC ARC WELDING, by E. Wanamaker and H. R. Pennington. 247 pages, 167 figures. Simmons Boardman Publishing Co. Price $4.00. A Review by D. J. McAdams, Metallurgist, Naval Engineering Experiment Station.

There has been need for several years of a book on welding written by a technical man for technical men, with careful selection and logical arrangement of material. The recent book by Wanamaker and Pennington does not appear to supply this need. This book contains a wealth of unselected information assembled without much regard for the principles of composition and rhetoric. The chapters (designated sections) are not arranged in logical order and the material is not properly distributed among these chapters.

The chapter on "Electric Arc Welding Principles" should have been placed before the two chapters on "Equipment," and "Installation." Obviously the advantages and disadvantages of the various types of equipment cannot be appreciated before knowledge of electric arc welding principles has been obtained. The chapter on "Training Operators" should have been placed after the chapters on "Electrode Materials," "Preparation of Work," etc. Microstructure, instead of being discussed in a final chapter containing a number of subjects that had apparently been overlooked and omitted from their proper location, should have been discussed in a separate chapter immediately following the chapter on "Electrode Material."

Following a chapter on principles of metallic and carbon arc welding, and the two chapters on equipment and accessories, a logical sequence would be chapters on electrode materials, macro- and micro-structure of welds, shaping and other preparation of metal parts to be welded, internal stresses and means of minimizing them, training of operators, welding of cast iron and non-ferrous metals, examples of practical application of arc welding, and a final chapter giving data on cost, speed, strength of welds, etc.

The illogical sequence of chapters in this book would not be so serious a defect if the material were properly distributed among the chapters. A redistribution of material would greatly improve this book. For example, the chapter on "Electric Arc Welding Principles" might well have been made broad enough to include carbon arc as well as metallic arc welding principles, thus including much of the material from the chapter on "Carbon Arc Welding." The chapter on "Training Operators" contains discussions of electrode materials, thermal disturbance, internal stresses, inspection of welds, etc., which belong in other chapters. On the other hand, this chapter should contain some specific directions that are given instead in the chapter on "Carbon Arc Welding." Most of the material in the last chapter on "Miscellaneous Notes and Data" should have been discussed in the chapter on "Electrode Materials" and in a chapter on Micro- and Macro-Structure of Welds.

The criticism given above deals entirely with composition. The proper selection of material for a book, however, is even more important than its arrangement. Selection of material for presentation depends on selection of the readers for whom the book is to be written.

After careful reading of this book, the writer is unable to visualize the readers for whom the book was written. As stated above there has been great need for a book on welding written for technical men. This book, however, does not seem to have been written for technical men, otherwise one would not find such statements as "oxygen is a colorless, tasteless gas. It is the most abundant and most widely distributed of all the elements, constituting by weight more than one-fifth of the air and eight-ninths of the water." On the other hand, the book does not seem to have been written for non-technical men since it assumes that the reader has knowledge of the principles of electrical engineering. It is assumed, for example, that the reader understands the meaning of such terms as "inductance," "reactance," "power factor," etc. Evidently the authors, as a result of failure to select their readers, failed to make careful selection of the material for their book.

Books on electric welding should be written for metallurgists as well as for electrical engineers. In fact such books should be written from the metallurgical point of view, since electric welding is essentially a metallurgical problem. For this reason books on welding should be written either by metallurgists, with enough electrical engineering knowledge to understand the principles of the electric arc and the various types of welding apparatus, or by electrical engineers with thorough understanding of the principles of metallurgy. Joint authorship by an electrical engineer and a metallurgist would favor the production of an excellent book on welding. The book under consideration is handicapped by the fact that both the authors are electrical engineers. Not realizing the handicap under which they were working, they have devoted much space to discussion of metallurgical questions and have even included descriptions of the manufacture of iron and steel. Descriptions of manufacturing processes, even if well written and free from error, are of doubtful value in a book of this kind. Brief descriptions of the properties of iron and steel are of course desirable. Unfortunately, however, the descriptions and discussions of metallurgical processes and of the properties of iron and steel contain the defects and errors that might have been expected, such defects as would undoubtedly be found if a metallurgist were to write a book on electrical engineering. As illustrations of these defects and errors, one need only quote the following statements: "Cast iron has no elasticity," "Manganese helps to remove phosphorus and sulphur; it slags these two elements out of the metal." "Nickel increases the tensile strength of steel without impairing its elasticity." "The metal in the converter contains ferrite." "The elasticity of the metal in the weld will always be less than the elasticity of the metal in the original plate." The authors' repeated use of the word "elasticity" in this book

is especially puzzling. Since cast iron has an elastic limit of about 6,000 lb. per square inch and a modulus of elasticity of about 13,000,000 lb. per square inch, it is hard to understand the statement that it has "no elasticity." One might think that ductility instead of "elasticity" is meant, except for the fact that in referring to cast iron the authors use the expressions "brittleness" and "lack of elasticity" in the same sentence. For example: "Its (cast iron's) brittleness, lack of elasticity and weakness also complicate matters."

In spite of the above discussed defects in selection of material, composition, and metallurgical desription and explanation, the book contains much valuable information on the subject of welding. The chapter on "Preparing Work for Electric Arc Welding" gives many illustrations of the different types of joints and designs and kinds of welds. This chapter is of great practical value. The same comment may be made concerning the chapters on "Application of Arc Welding to Railroads and Structural Engineering," "Equipment for Arc Welding," and "Installation of Arc Welding Equipments—Welding Accessories." The remaining chapters contain many good paragraphs scattered throughout material that is either misplaced or that should have been omitted. It is to be hoped that the authors in a later edition will improve the book by rearranging and condensing the material and eliminating the metallurgical errors.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-ninth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of life, regular, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio,* an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become asociate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Asociate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nomination shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

NOTICE

NAVAL INSTITUTE PRIZE, 1923

A prize of two hundred dollars, with a gold medal and a life membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following pages are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1922 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1922. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1922 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles submitted be typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

C. C. GILL,

Commander, U. S. Navy, Secretary and Treasurer.

TOPICS FOR ARTICLES

Suggested by Request of the Board of Control

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnoughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
Shore Duty for Enlisted Men.
The Limits of Specialization in Naval Training.
The Effect of the 5-5-3 Ratio Upon U. S. Naval Strategy in the Eastern Pacific.
Armor or High Speed for Large Surface Vessels?
Airplanes and Submarines Versus Super-Dreadnoughts.
The Navy's Relation to the Nation in World Affairs.